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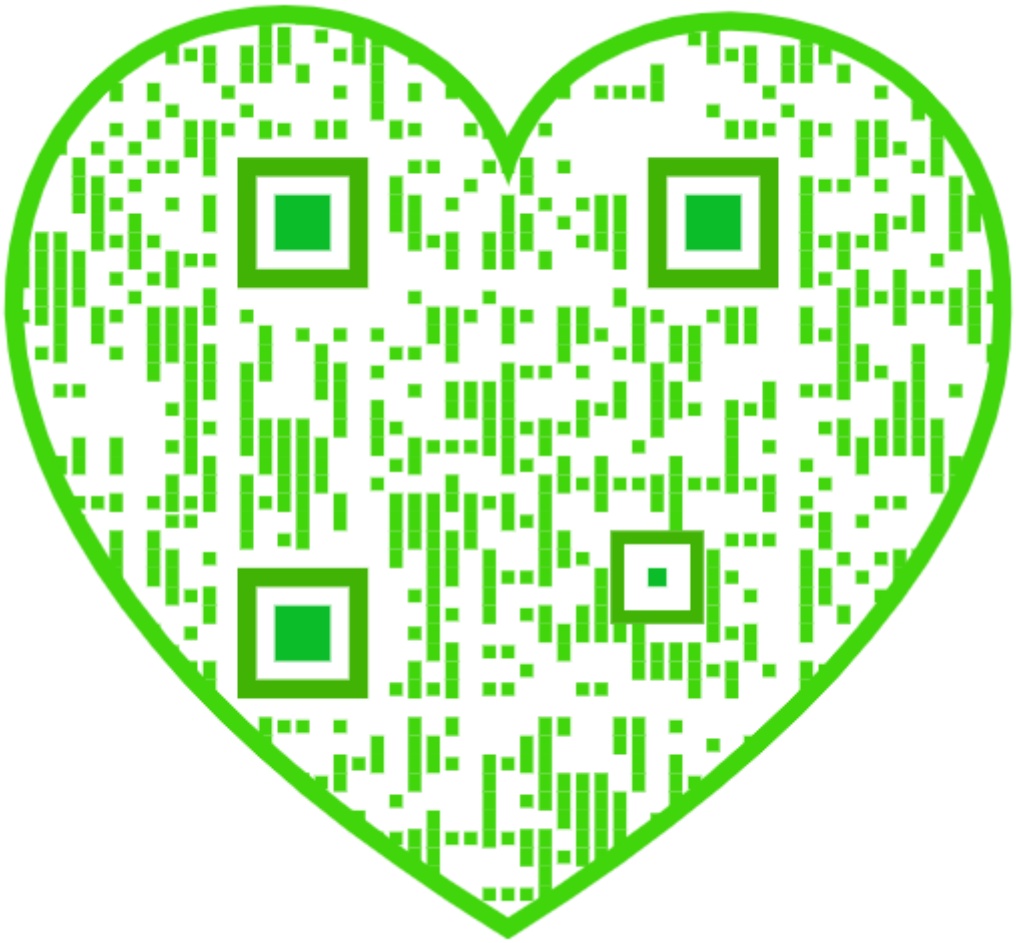

SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

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NEW YORK, JULY 5, 1873.

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THE PREPARATION OF PEAT FOR FUEL.

There is no more important economical question under discussion, at the present day, than that which broadly includes the production and manufacture of fuel for industrial and domestic purposes from new sources, and especially the substitution, for coal and wood, of peat and similar products, which are capable of being obtained and prepared at a much less comparative cost. The subject of the utilization of peat as fuel, though of great interest in this country, is in England, probably on account of the temporary famine and stress of prices in coal, and also by reason of the apprehension which exists regarding the ultimate exhaustion of the mines of the kingdom, strongly attracting the attention of scientific men, leading them toward investigations and experiments, the results of which may be considered as embodied in such improved machines as that to which our engravings refer, and to which we shall presently allude.

It is well known that both in the northwestern section of the United States, and to as great, if not to a greater, extent in certain parts of Canada, very large deposits of peat exist. It may be safe to predict that, in view of the scarcity of other fuel in such districts and the rapid progress which is being made to the improvement of means for utilizing the bog product, ere long the latter will be exclusively employed both for domestic and manufacturing uses.

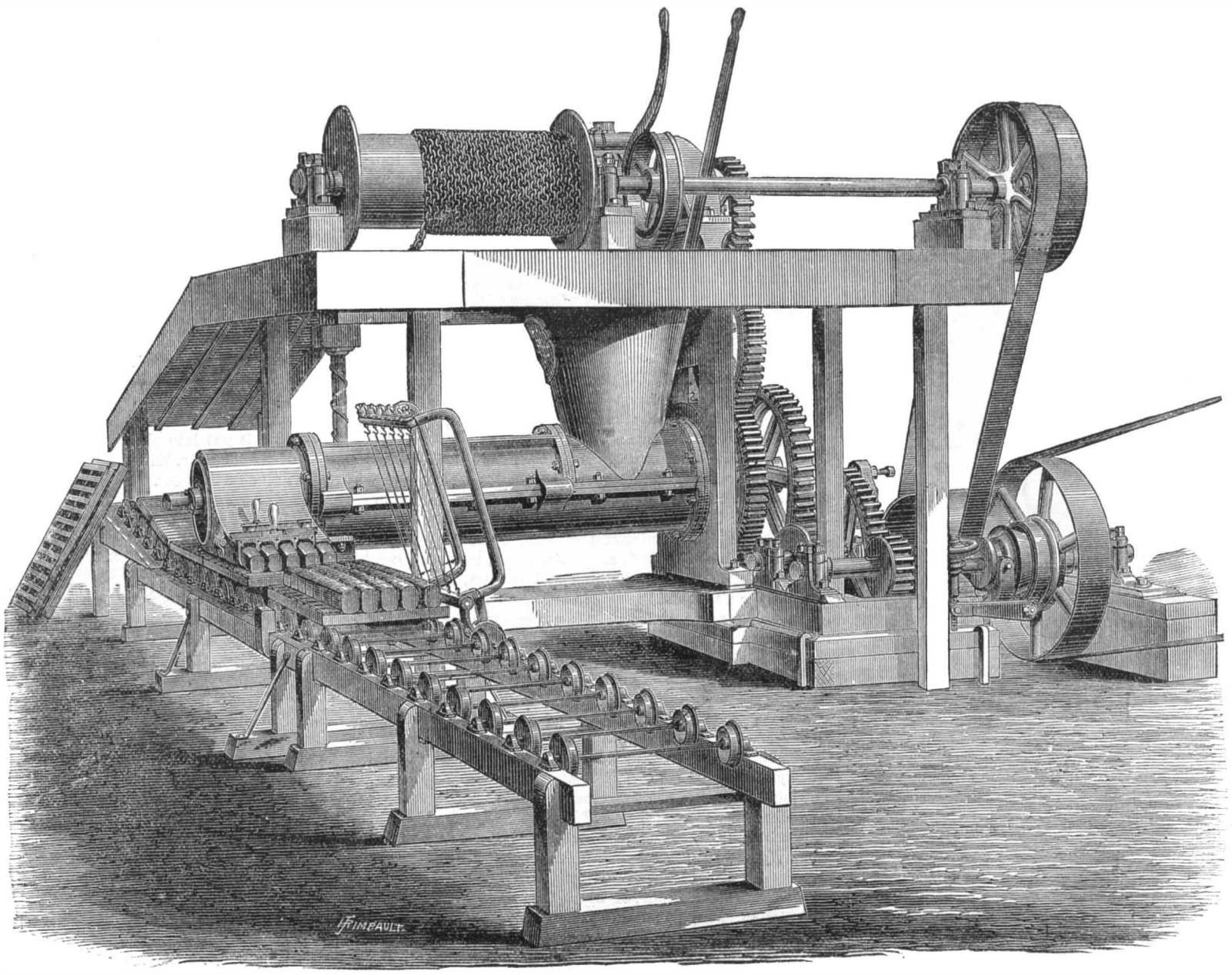
Of the associations which, in the Dominion, are at present organized for the prosecution of this industry, we have recently received the prospectus of one, the Huntingdon Peat Company, the field of the operations of which is located in the county of Huntingdon, forty-seven miles from Montreal. The peat bed there situated is said to be of superior quality, and comprises about 800 acres, averaging from 10 to 18 feet in depth of pure vegetable matter, and capable of yielding 3,000 tuns of dry peat per acre. The process employed, known as R. A. Griffin's patent, consists in raising the peat by a system of endless chains and buckets, throwing it into "curers," in which the water is strained from it. The peat is then passed into a mill; and within fifteen or twenty days from the time it leaves the bogs, it is fit for the market. The cost of the necessary machinery calculated to produce 100 tuns per day, at a cost of $1.25 per tun, is estimated, in the prospectus above referred to, at $35,000.

Whether or not peat can be profitably employed in the manufacture of iron, is a question which many of the iron trade journals have lately made the subject of protracted controversy. The matter seems to rest upon the economical and more especially the rapid preparation of the fuel for use; for when it is first taken from the bog, it is so saturated with moisture that its combustion is perforce a very slow process. Naturally, the efforts of inventors have been especially directed toward surmounting this difficulty; and while the patentee of the Canadian process, before noted, has effected a stride in advance in reducing the three months, generally required for drying the material, to fifteen or twenty days, the manufacturers of the machine represented in our engravings, Messrs. Clayton, Son, & Howlett, of London, England, have made much greater progress by diminishing the time necessary to completely extract the hygroscopic and fixed water, and to compress the substance into convenient form for stowage and transportation, to scarcely as many hours.

Before entering the apparatus (for the engravings and description of which we draw upon the pages of the *Engineer* and *Engineering*), the peat is filled into squeezing trucks, in which, during its journey to the works, all free water is squeezed out of it by mechanical devices.

From the trucks the peat is tipped into the vertical hopper of the machine, in which are inclined blades fixed upon the vertical shaft. The blades which, with other internal arrangements are shown more clearly in the sectional view, break up the lumps of peat and press the mass downwards into the horizontal cylinder into which it is fed by a worm placed on the central shaft. The peat is thus brought within reach of the propelling arms which are fixed spirally around the central shaft in the horizontal cylinder, and which pass between sharp steel knives. The knives are made with dovetailed feet, and are received into corresponding grooves in a removable bar plate, which is secured in the side of the horizontal cylinder by bolts. By means of the scissor-like action of this internal machinery, the peat is cut up into small pieces and squeezed and kneaded together. The fibers of peat are, by this treatment, so divided that facility is given for setting free all moisture and fixed air that may be retained in the cells of the stalks, and the peat is deprived of elasticity, or resiliency, so that it is reduced to a suitable condition for molding. The spaces between the cutting knives are gradually reduced from the feeding to the delivery end of the cylinder, the propelling arms being correspondingly placed. The molding orifices are adjusted at the nose of the machine, and may be of any desired form. Five of these orifices have hitherto been used and have been found convenient in working.

Beneath the chamber upon which the molding orifice is fixed, and which is seen to the left of the machine, is a roller table on which the trays for receiving the molded peat are placed in succession by a boy, so that they run in a continuous series underneath the molding orifices and receive the peat issuing from them. As the front end of each tray comes up, the workman severs the streams of molded peat by means of a sliding cutter, and pushes the loaded tray forward until it is opposite the cutting frame, in which several wires are stretched. These wires, being brought down on the peat, sever each bar into pieces five inches long, which is a convenient size for use. The loaded trays are sent along the roller table until they are opposite the tray racks. The trays are then lifted off on to the racks, where they remain for about three days, until the peat will bear handling, when they are placed upon the open shelving for final drying. The tray racks consist of uprights with arms fixed upon them between which iron rods are strained. The contingency of accident to the machinery, from stones or hard foreign substances passing in with the peat, is provided against by means of a friction clutch, seen to the right of the machine in front of the driving gear. This clutch can be screwed up to give any desired pressure, or resistance, and when any substance having an objectionable degree of solidity passes into the machine, the clutch slips, its resistance being overcome, and breakage is thus avoided. The cylinder has a movable cover so that the interior may be readily examined, foreign substances removed, knives replaced, or anything else necessary done.



CLAYTON & CO.'S PEAT COMPRESSING MACHINE.

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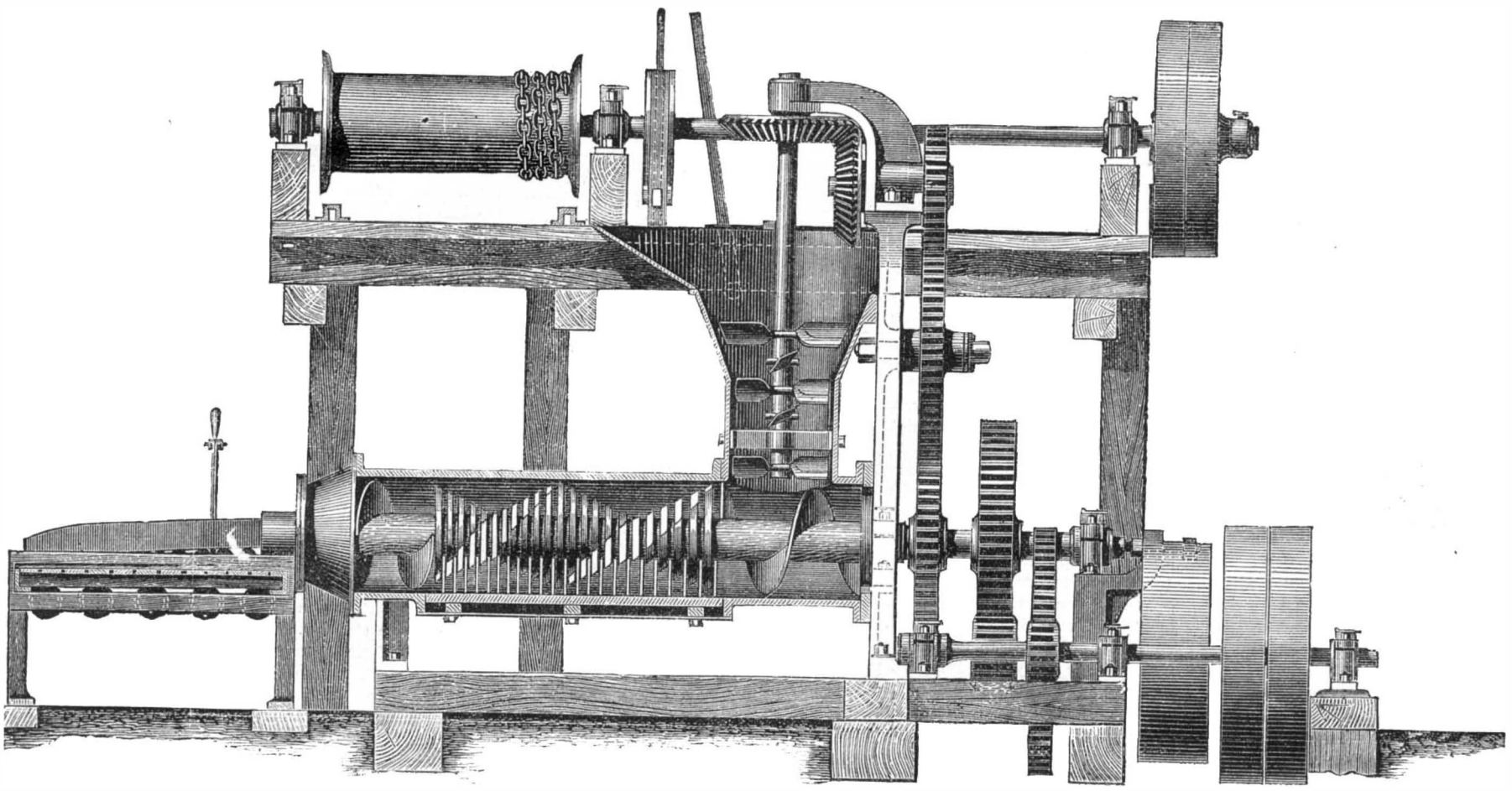
The producing power of the machine has been fairly tested, and, so far, the yield has been found to be at the rate of from 75 to 95 tuns of crude peat per ten hours. The output of raw material appears to depend much upon the state of moisture of the peat bog, being greatest when the peat is wettest and least fiberous.

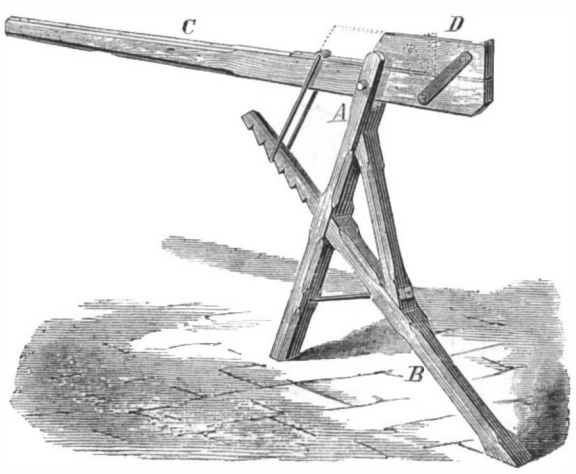
Various kinds of peat have been tried by this machine, and it is interesting to notice the difference between the peat dried without having been previously treated, by the machine, and that which has been operated upon. Peat of very fiberous nature when dry has an open spongy appearance, suggestive of cocoa nut fiber. The same peat treated by this machinery becomes compact and hard, and assumes a specific gravity of from 1·05 to 1·10, while black decomposed bog condenses to about 1·20. A set of machinery to work 100 tuns of crude peat employs, in all, ten men and five boys, including diggers, engine drivers, men in drying sheds, etc., so that the cost, allowing a fair amount for wear and tear, is placed at from 87 cents to $1.25 per tun.



PEAT COMPRESSING MACHINE—SECTIONAL VIEW.

THE HERCULEAN LIFTING JACK.

The invention illustrated in the accompanying engraving is an improved lifting jack, invented and patented by John Riddlesberger, of Franklin county, Pa., and which, it is claimed, may be advantageously applied to many uses. The framework consists of a standard, A, combined with an auxiliary standard and brace, B, in a strong and snbstantial manner. A lever, C, rests in a slot formed in the upper end of the post, A, and is secured by a bolt passing through it. By means of an attachment, D, on its short arm, the lever can be adjusted to different hights. The falling link shown



serves to secure the apparatus while the weight is suspended.

In operation, the short arm of the lever is placed under the axle of a wagon or other weight to be raised. The opposite or long arm is then borne down, when the falling link becomes engaged in notches formed in the under side of the post, B, as represented.

For further particulars regarding sale of territory, agencies, rights, etc., address Dr. I. N. Snively, Waynesboro', Franklin county, Pa.

The Modes of Steel Making.

A priori, the making of steel by removing carbon from cast iron is the most rational way, says the *Engineering and Mining Journal*, because it is the most direct; but a trial shows us at once that directness is not the only premise which must be regarded. There are two other things which go to the making of steel. One is purity of product and the other is equality of "temper." A pure product is only to be had by using a pure pig; and, as this article is not always obtainable, that process is, generally speaking, more rational which introduces some purifying operation—like the conversion of cast iron to wrought. As to the equality of temper, that depends upon the amount of carbon left in the steel (neglecting other elements). Here again repeated trials have shown that it is very difficult to hit the exact amount of carbon in every operation when oxidizing agents are used, and a large proportion of past failures have been due to this difficulty. So that, after all, the direct conversion of cast iron into steel is not the most rational mode, because it leaves two important requirements unregarded. On the other hand, wrought iron, being a purified product of a tolerably definite composition, satisfies these requirements, and may, therefore, rationally be used for steel making. In practice we find both these kinds of iron used together. In such cases, the wrought iron must be considered as the leading raw material, while the cast iron is a carbonizer.

The old idea that the direct conversion of pig metal into steel is the only rational process has cost inventors untold agonies of mental activity, and capitalists have suffered quite as much in pocket on account of it. The proof that the idea was wrong is to be found in the constant abandonment of the process in steel making of every kind. Crucible steel, furnace steel, and Bessemer steel making processes are now, in most cases, founded upon the principle of using wrought iron as a basis and either carbon or pig metal as a carbonizer.

Effect of Sulphur Water on Iron Pipes.

Dr. E. Priwoznik, in *Dingler's Journal*, says: It appears that, when the iron mains conveying the mineral water from a source near Hainburg, Austria, were taken up after having been for more than a dozen years underground, the iron thereof had been strongly acted upon, as exhibited, by the difference in structure, upon the fracture. On being analysed, the author found the interior layer to consist, in 100 parts, of: Hydrated oxide of iron $[(Fe^2)^2O^3(OH^6]$, 81·08; free sulphur, 12·29; sulphuret of iron, 4·48; hygroscopic water, 0·57; nickel, cobalt, magnesia, silica, traces of carbon, and chlorides of ammonium and sodium, 1·58. The second layer was found to contain only 79·2 per cent of iron, but no sulphuret or excess of carbon was discovered; while the third outmost layer was almost pure cast iron.

A Leaf from the Early History of the Mowing Machine.

Jeremiah Bailey, of Chester county, Pa., was one of the early American inventors, whose contributions to the mechanical arts have so greatly assisted the progress of the country. In 1822 he obtained a patent for a self-sharpening mowing machine, which was considered of so much importance that it was engraved and printed in London, in the *Mechanic's Magazine* for November 1, 1823, almost fifty years ago. We here give a copy of the engraving and quote the remarks of our venerable cotemporary:

"The mowing machine, of which the annexed cut is a representation, was invented by Jeremiah Bailey, of Chester county, United States, who has obtained a patent for the same. [Patented February 13, 1822.]

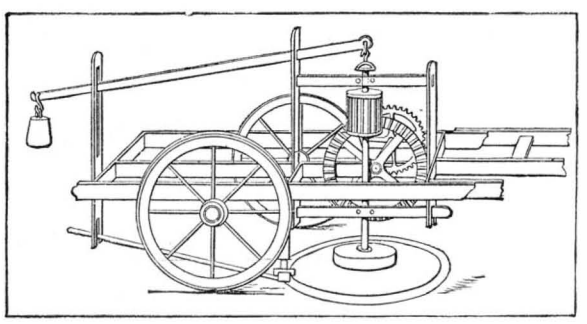
"It has been extensively used and approved of during the last season, in the neighborhood of the patentee, and promises to be of great public utility. It is understood that it will mow ten acres per day. The following description will explain its operation, and show the skill and ingenuity of the inventor.

"This machine is supported by two wheels on different axles. The left wheel is fixed to its axle so that they revolve together. The right revolves on its axle like a common cart wheel, and is placed about a foot further back than the other. The left works within the frame, and has a circle of cogs screwed on the outside of the fellows, but of a less diameter, to keep them from the ground. These cogs work into a vertical cog wheel in front, that turns an iron shaft extending horizontally towards the center of the machine; upon the inner end of this shaft is fixed a vertical fuce wheel, whose cogs turn a trundle head or a vertical shaft. To the bottom of this shaft, near the ground, is fixed a circular horizontal frame work, on the circumference of which is screwed the scythes in six parts, laid horizontally, with the edges turned outward, so as to form a complete circle. To keep the scythes at a proper distance from the ground, the bottom of the shaft is supported on a piece of wood of the machine, secured by a tye from the tail, somewhat resembling a sled runner, in which it works in the manner of a gudgeon—with the inequalities of the ground, the scythe frame, shaft and trundle head rise and fall.

"The edge of the scythe in its revolution passes under a whetstone fixed on an axis, and revolving with the scythe. To create friction, this axis is more or less inclined to the line of direction of the revolution according to the friction required. This stone, by means of a sliding rod, by which it is attached to the machine, rises and falls with the scythes.

"To prevent too great a pressure of the trundle shaft and scythe frames on the ground, a lever, like a steelyard, is fixed to the top of the shaft, extending to the tail of the machine, where it is weighed according to the nature of the ground and grass.

"The horse is put into shafts, and *walks* in front of the left side of the machine, and always on the mowed ground after the first swarth is cut.



"By the increase of velocity, the scythes revolve with great swiftness. The grass, as it is cut, is first thrown by the progressive motion against a rise in the scythe frame toward the center, and by the same motion is afterwards thrown off in a regular row, following the center of the machine."

New Plan of Removing Sand Bars.

A method of removing sand bars from rivers, invented and patented by Alfred Garnham, of St. Louis, Mo., consists in anchoring a cable under water, and providing the cable with angular arms, so arranged that the force of the stream will actuate the arms, make them revolve and beat up the sand, which is swept away, as fast as loosened, by the current.

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LIFE IN THE BEEHIVE.

The following is from a recent lecture by Professor Agassiz, at Cambridge, Mass., reported in the New York *Tribune:*

At the close of my last lecture I made some general statements concerning parthenogenesis, a peculiar mode of reproduction by virgin females, first investigated in some families of insects, among which the progeny thus brought forth consists of males and of males only. In the family of phyllopods, among crustacea, this process obtains also; but the progeny in this case consists, on the contrary, of females only. The deportment of these animals at the time of reproduction is so singular, they exhibit faculties so peculiar, that they have been the objects of careful observation. Their seemingly intelligent action, known as instinct, has been compared with the intellectual powers of the higher animals and even with the mental faculties of man himself. A knowledge of the facts is therefore important to a just discrimination between those two faculties, which are considered by some as entirely distinct, while others regard them as modifications of one and the same power. It is often said that the possession of reason places man above the brute creation, to which instinct peculiarly belongs; and yet the facts do not justify such a distinction, as we shall find if we study carefully the lives of some of these creatures.

THE BEEHIVE COMMUNE.

The beehive consists, when in full activity, of one queen, several hundred drones, and many thousand working bees. These constitute a community by which a combined system of labor is carried on, transcending in many respects the most complicated actions of man himself. Their structure shows no organ similar to those by which the mental functions are manifested in the higher animals and in man.

INSECTS HAVE NO BRAINS.

They have no brain proper, nor does their nervous system correspond in any way to that of the vertebrates. In all vertebrates the solid front mass of the nervous system which we call the brain is prolonged backward into a long cord, known as the spinal marrow, from which many nervous threads arise and branch, spreading through the whole organization. The brain and the spinal cord, in fact the whole central nervous system, are inclosed in a cavity, the skull and rachitic canal, separate from those in which the organs of digestion, respiration, circulation and reproduction are contained—the chest and abdominal cavity. For the articulates, on the contrary, to which all insects, crustacea, and worms belong, the nervous system is scattered along the length of the body in a succesion of swellings connected together by threads. The first of these swellings is situated in the head, above the alimentary canal; the rest are at regular distances along the lower side of the body. Thus it appears that the battery from which all volition starts, by which all the acts of life are performed or regulated, through which all external impressions are communicated and acted upon, are very different in these two types of the animal kingdom. It is therefore hardly probable that the life work done by these organs should be the same.

INSTINCTS OF BEES.

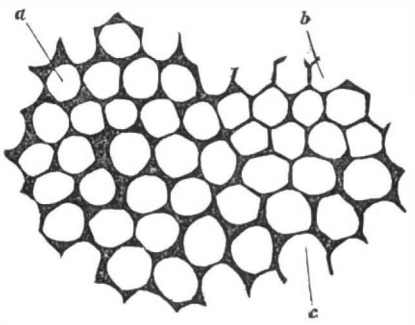
Let us look at some of the acts by which the quality we call instinct is manifested in a community of bees. When such a community becomes too populous for a given hive, the bees "swarm," as it is called; that is, a part of the overcrowded population separates from the rest and goes off to establish a new colony. In such case the emigrants are chosen or form their own band with direct reference, seemingly to the future welfare of the new colony, preserving the numerical proportions characteristic of all prosperous hives. The swarm consists of one queen, some thousands of working bees or undeveloped females, some hundreds of males or drones. This is the normal combination in the bee community, and hives so organized may survive and keep together for many years.

DURATION OF BEE LIFE.

There are reports of beehives a century old. This is, however, probably an exaggeration; for beehives 20 years old are rare, and they do not often survive more than seven, eight, or ten years. When I speak of the life of a beehive, I do not mean to say that the individuals composing it live together for that length of time; indeed, a queen rarely lives beyond three or four years; one of seven years is seldom seen, while the males never survive the summer in which they are born, and the working bees die gradually and are replaced by new ones. But the hive as a community holds together for a much longer period, being constantly renewed by the process of reproduction, and comes at last, like a human settlement, to consist of a variety of individuals born at different times. When a swarm breaks off from an old community to form a new colony, the division is generally due to the appearance of a new queen.

REMARKABLE FACTS CONCERNING THE QUEEN BEE.

The queen bee, usually quite contented with her lot, watching over her progeny, active and patient in the care of her eggs, becomes furious if a rival arises in the hive. She pounces upon her, and they sometimes fight to the death. So well is this understood in the hive that the workers take care to prevent such conflicts by holding back the new queen, just ready to be hatched from her royal cell, till the bees have swarmed. At such a time the workers will stand by the cell, out of which a queen is to be born, ascertain how far her transformation is completed, and, should there be a disposition of the young queen shortly to creep out, they increase the deposit of wax upon the lid which shuts the cell, thus preventing the egress of the royal prisoner. If she tries to break through or attempts to gnaw her way out, the workers crowd around the opening or accumulate such an amount of wax upon it as to frustrate all her efforts. When the old queen has peacefully departed, the new one is set free. What makes this fact more extraordinary is that usually the workers have never seen the birth of a queen or perfect female before; their hive has known but one queen, and yet they anticipate and guard against all the dangers likely to arise from a second. Can it be that these creatures do the right thing at the right time consciously, by means of any faculty similar to our reason?



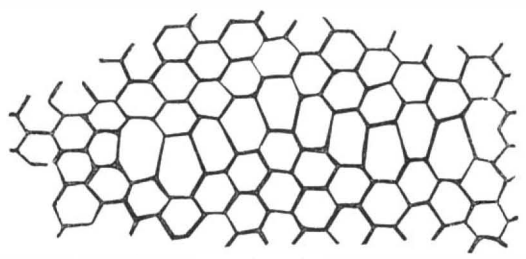
TRANSITION CELLS OF BEE.
a. b. Rows of intercalated cells. c. Drone cells.

CONSTRUCTING THE HONEYCOMB.

The swarm, having escaped, chooses a place for the new colony—a cavity in the rocks, perhaps, or a sheltered notch among branches of trees. The swarm having alighted near a favorable spot, a single working bee—one out of twenty thousand, perhaps—starts from the crowd and lays, not the first stone, but the first piece of wax which is to be the foundation of a new comb. Before swarming, they have provided themselves with an ample supply of wax and food, and are prepared to build their new home.

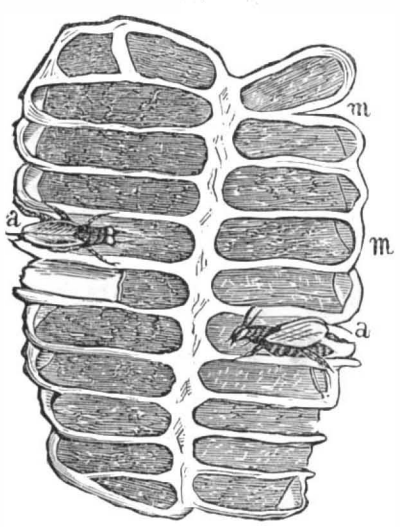
TRANSITION CELLS.
a. Working bees. b. Drones.

The construction of a honey comb, with a double row of cells on opposite sides, dovetailed into each other, and with larger cells for the drones and the special cells for queens, is so well known that I need not dwell upon what every encyclopædia will give. The first cells, being raised upon an uneven surface, are often irregular and may be uninhabitable on that account, but they then make the foundation for perfect cells, whose regularity and precision of form and relation have been the wonder of all ages. The irregularity of the first cells, adapted to the unevenness of the surface, seems only another evidence that these animals work deliberately, not like machines. Dr. Wyman has published a most interesting paper upon the irregularities of the cells in a honeycomb.



WORKER CELLS.
Showing variations in the form and size of the mouth. Copied from Professor Wyman's paper.

I dwell upon the fact that the first cells present every possible variety of shape modified to suit the situation, because it is not generally understood.

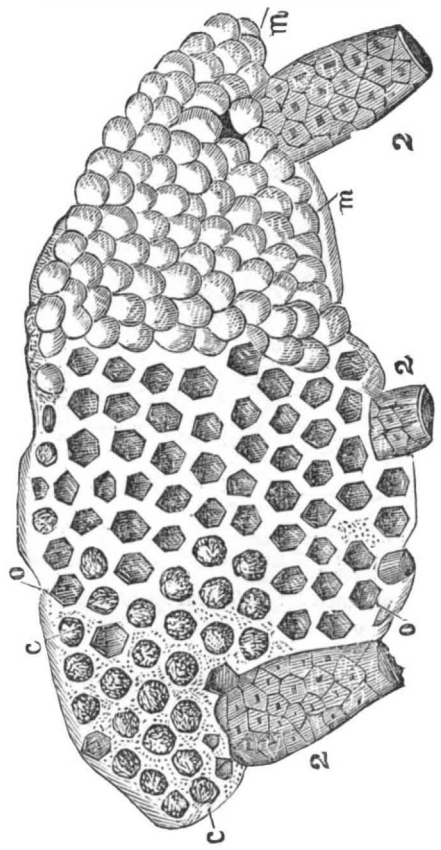


CELLS IN A BEEHIVE.
m. m. Honey cells with lid. a. a. Bees bringing honey in. The whole is seen against a pane of glass.

The first bee having made the first cell, a second bee comes and stands opposite her, head to head; then another at her side, so that the two stand side by side, and the rest follow in definite position, each building a cell around itself until gradually a good sized comb is built, it may be a foot in length and six or seven inches in depth, the width being uniformly that of a double row of cells. All this work is done by the imperfect females or so-called workers. Neither drones nor queen take any part in it. The working bees, on the contrary, are ever active, bringing in supplies for the community, swarming out daily to collect honey, filling the cells, as fast as they are completed, with food, and then closing them to prevent escape, thus securing large stores of honey. The drones meanwhile look lazily on. Sluggish and inactive, they seem to have different temperaments from the working bees.

THE DISTINCTIVE CHARACTER OF THE CELLS.

The honeycomb being sufficiently advanced, the queen now begins to lay her eggs in the cells. Here comes in another marvelous evidence of that power we call instinct. We have seen that a certain numerical proportion is essential to the well-being of a hive. There must be but one queen and at the most two or three queens' eggs, and even then trouble is sure to arise when these are hatched; there must be several hundred drones, and there must be many thousand workers. In preparation for this, the workers have laid out the cells as systematically as if they had been guided by a superior intelligence; special cells adapted for the eggs out of which thousands of imperfect females or workers are to be produced; others somewhat larger, intended for the development of the less numerous drones, and a very few so-called royal cells, still larger than those of the drones, many times larger than those of the workers, and of a very peculiar form, out of which perfect females or queens are to grow.



THE THREE KINDS OF CELLS.
m. m. Honey cells, closed. c. c. Cells with young bees, closed. o. Open cells. 2 2 2. Royal cells open.

The queen cells stand out from the rest of the comb, and have a large opening. Two or three such cells will usually be formed in one comb. In old colonies, it often happens that no provision is made for the advent of a new queen, and in that case no royal cells are built; but in a new community several such cells may often be seen upon one comb. Still more perplexing than the impulse, or instinct, or unconscious perception, by which the workers are guided in the preparation of these cells, is the intelligent selection shown by the queen in distributing her eggs among the various kinds of cells. She finds thousands and thousands of small cells, and in these she deposits fecundated eggs out of which nothing but workers grow. In the royal cells, or, as is the case in many hives, in one royal cell, she lays an egg, also fecundated, out of which is sure to grow a perfect female, or, in other words, a queen. The eggs of the perfect and imperfect females do not differ originally; the ultimate difference is brought about by a special mode of nursing and feeding the royal egg, the workers supplying the royal cell, in advance, with pollen from the stamens of flowers and honey; so that when the little grub comes out of the egg, it finds itself in the midst of the nourishment necessary for its development into a queen bee. How do these careful nurses know the amount and quality of food needed by the eggs they have in charge? To this question there is no answer. But there is no doubt of the fact, and they perform their work with surprising economy and accuracy. In the drone cells the queen lays only unfecundated eggs, and these always produce males and males alone. The faculty by which all these acts are performed without teaching, without preceding experience, without any antecedent knowledge of the conditions necessary to the life and growth of the eggs, that faculty we call instinct, in contradistinction to those mental processes involving argument, rational consideration, combination and adaptation, by which acts are performed under full consciousness of all contingent conditions.

THE EGGS, WHAT THEY BRING FORTH AND HOW THEY ARE FECUNDATED.

It may be asked how it has been known that certain eggs were fertilized while others remained unfecundated. The facts have been gradually made out by very careful and connected observations. It is known that with bees, as with

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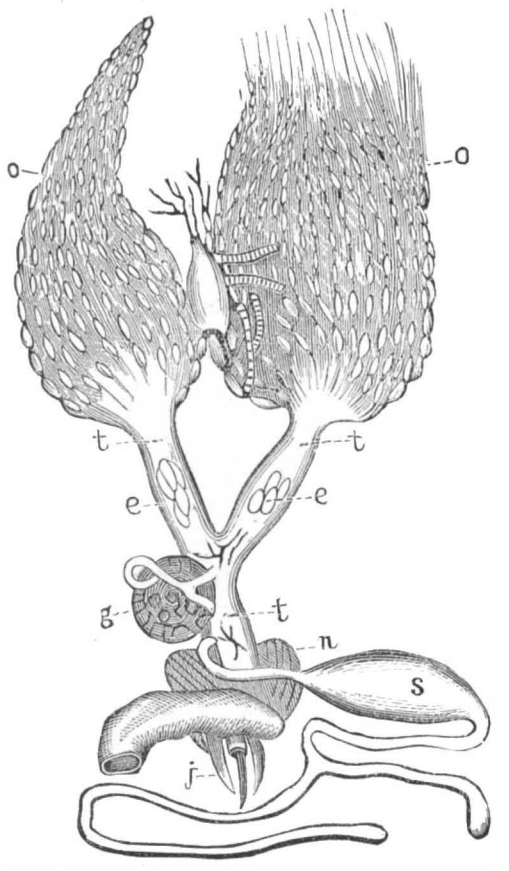
most birds, the act of copulation takes place outside of the hive in the air during flight. It happens sometimes that a queen bee, from injury or from malformation, defective wings, for instance, is unable to fly and cannot leave the hive. Under these circumstances she is incapable of fecundation, and yet has been seen to lay eggs, and these eggs invariably produced males or drones. This fact gave the clew, and successive observations proved beyond a doubt that the workers were always born from fecundated, the drones from unfecundated eggs. It remained a mystery how, in the same ovary, a certain number of eggs could come under the fertilizing influence while the rest remained untouched.



OVARIES, ETC., OF BEE.
o. o. Ovaries. e. e. e. Eggs in oviducts. g. *Receptaculum seminis.* n. j. Sting. s. Poison bag.

Siebold ascertained by a skillful anatomical investigation that the special organ of the queen bee, in which spermatic particles are received, has a muscular apparatus which enables her to close or open it at will. This organ, known as *receptaculum seminis,* is placed just at a point of the oviduct or canal through which the eggs are passed when they are dropped from the ovary, half way between the ovary and the outlet of the oviduct. The queen stands on the edge of the cell in which either fecundated or unfecundated eggs are to be deposited. If the former, she has the power to open this receptacle, the organ in which the spermatic particles have already been received, and to allow one or two such particles to come into contact with the egg; if not, she can close the organ and allow the egg to pass out unfecundated. Siebold has shown that eggs cut out above the opening of the *receptaculum seminis* into the oviduct, at which these organs connect, are always unfecundated.

Siebold has investigated a similar set of facts in the history of another species of hymenoptera, a kind of wasp of the genus *tolistes.* In this case, the queens, which are fecundated in the autumn, begin to lay their eggs early in the spring; out of these eggs are born a variety of individuals, workers and males, as in the bee community. By a careful destruction of all the males, which was accomplished without injury to the comb, Siebold ascertained that parthenogenesis obtains in this family also. Plenty of eggs were laid after the males were destroyed, but the perfect insects they produced were always males and never a single female. It is now clearly proved, not only for wasps and bees, but also for a number of other insects belonging to the hymenoptera, that virgin females may produce male offspring without any participation of males.

Scientific Prizes.

The report of the prizes offered by the *Société d'Encouragement pour l'Industrie Nationale* of Paris for 1873, is as follows:

Chemical arts.—Six prizes have been offered: 1. Prize of $400 for the industrial application of distilled water; no candidate. 2. Prizes of $200 for the industrial application of any cheap and abundant mineral product; no candidate. 3. Prize of $200 for a useful application of recently discovered metals; no candidate. 4. Prize of $600 for the artificial preparation of a black compact diamond; one candidate appeared, but, as the experiments of the committee showed that the specimens sent did not fulfil the conditions required, the prize was not awarded. 5. Prize of $200 for a process capable of effecting the prompt and durable disinfection and clarification of sewage; the engineers of the Municipal Service of Paris, commissioned to study the question of disinfection and the application of sewage water, have presented a complete and detailed account of the experiments made, and the remarkable results obtained; as these experiments have been conducted on a very small scale, and, as important sewage works are in progress, the Council of the Society has decided to suspend the award of the prize. 6. Prize of $200 for refining, in France, Bolivian nitrate of soda, and extracting the iodine which it contains.

Economic arts.—Prize of $600 for an apparatus giving an electric current, constant in direction and intensity whose electro-motive force and conductibility shall be comparable to those of a nitric acid battery of sixty to eighty ordinary sized elements, and showing superiority in economy or salubrity over the machines now in use; the prize was awarded to M. Gramme for his magneto-electric machine.

Correspondence.

Deep Sea Soundings.

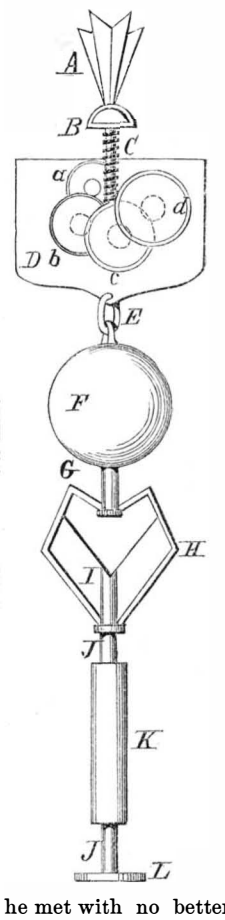
To the Editor of the Scientific American:

Dr. George Robinson, in an article published in your journal of April 19, suggested the idea of dispensing altogether with a line in deep sea soundings, and explained how an apparatus might be so contrived as to re-ascend to the surface after touching the bottom. Mr. Charles H. Lewis suggested afterward that the use of a pressure gage might obviate the difficulties presented by under currents, and by headway or leeway, if sounding is done from a ship. Several other correspondents have agitated the question, but as they are evidently unaware of the many experiments that have already been made to ascertain the depth of the ocean, a perusal of a short article, published in the *Nautical Magazine* forty-one years ago (in 1832), may prove interesting to them and to many of your readers.

Even if the idea of dispensing with a line in deep sea soundings were new, the obstacles described so clearly by Mr. Hawley N. Cargill, of Grand Rapids, Mich., present the real difficulties, namely, the under currents, the immense pressure of water, and the low temperature at a great depth. This correspondent takes a practical view of the matter, and I am as ready as he is to consider the suggestion, by Mr. Lewis, of a pressure gage as perfectly reliable and practical as far as a line could be made to reach; it is so practical, indeed, that it has been in use for many years, and I used it myself in the French navy at least twelve years ago. But to show the ideas of our grandfathers on this subject, here is a copy of the article, addressed by a correspondent to the *Nautical Magazine,* over forty years ago:

"The depth of the ocean is a subject on which many opposite opinions have been advanced; and with the hopes of determining so interesting a problem, a few years ago I constructed a machine, somewhat resembling that by Mr. Massey, but differing from his in not requiring the assistance of a line. The principal obstacles with which I considered that it would have to contend, were seaweed, tides, and under currents, which latter might sweep it away from the place where it was sent down. However, regardless of these, I set to work and completed the machine. My first experiments with it were made in shallow water, and, to ascertain its correctness, I attached it to a line that was marked. The results were most successful; and I was delighted to find it answer so well, for I invariably found the depth of water given by the machine precisely the same as that by the measured line.

"After being satisfied that my plan was likely to succeed, I submitted it to the Admiralty, and to my friend Captain Mudge, who communicated it to a scientific friend of his at Woolwich. This gentleman soon after inclosed me an etched plan of the apparatus, with his remarks on it, informing me, at the same time, that the celebrated Dr. Desaguliers had made an attempt, something similar to mine, with a glass globe; but that, after various essays, he could never recover the machine. This he attributed to drift, or to the bursting of the globe from excessive pressure; but as the trials had been made under many unfavorable circumstances, no positive inference could be drawn from them.



"The following is an explanation of the machine as annexed: A is the vane and flies; B, two connecting swivels; C, perpetual screw; D, plate for the wheelwork; *a b c d,* wheels of different diameters, similar to Massey's; E, suspension ring; F, float glass globe; G, catch with shoulders; H, clasps disengaged by the arm at I, connected with the rod, J J; K, lead to sink the whole; L, foot to the rod, in case of an oozy bottom.

"It will be readily seen that, when the weight is disengaged from the rest of the machine, by the opening of the clasps caused by the rod striking the bottom, it will remain there, and the globe will carry the other part to the surface."

Here ends the article; and as nothing has been heard of the experiments made afterwards by the inventor in deep water, it is probable that he met with no better success than Dr. Desaguliers. The method of adapting a pressure gage to a sounding apparatus must, according to the article in the *Nautical Magazine,* have been invented by Massey about fifty years ago.

LAURENS DE WARU.

Baltimore, Md.

Psychic Force on the Slate.---No. 2.--An Exposition.

To the Editor of the Scientific American:

In my former article (on page 195, volume XXVIII) I gave a description of what appeared to be a wonderful phenomenon. After having witnessed the performances of the so-called spirits at several *séances,* I have at last hit upon the way the thing is done. I now give it to your readers that they may not be gulled as I have been. It may be made the source of a great deal of amusement.

Procure a slate and a number of short pencils, also a small table (one with four legs is the best). Cover the table with a cloth, and turn the lights down—this is done for concealment—but explain that spirits will only write in the dark for you, therefore the table must be carefully covered to exclude the light. Grasp the slate with the right hand, lay a pencil near your thumb, hold the slate under the table horizontally, place the left hand on top of the table. At first it is best to sit so that your knees will not be suspiciously close to the table. After holding the slate a few minutes, say that you don't know that the conditions are favorable. Presently throw the pencil off with the thumb or finger, or get it between the thumb and finger and shoot it up against the table, as a boy would a marble. Call attention to it, and say there appears to be something there. Replace the pencil and presently shoot it up again. Do this several times and it will excite a great deal of wonder, especially if you make as little movement as possible. Next place a pencil between your fingers under the slate, rap with it about a dozen times, ask: "Is there a spirit present? If so, rap three times for yes, twice for no." Answer: "Yes." "Can you write?" Answer: "Yes," if the spectators are not watching you too closely; otherwise rap "no," and continue to rap the answers. Now get closer to the table. To write on the slate, hold the pencil between your thumb and finger, and the slate between your third and little finger; rest the slate against your left knee, or between the knees if convenient, or against the side of the table. This will give you more freedom to write. After writing an answer on the slate, shoot up the pencil; turn the slate over, grasp it as at first, withdraw, and, wonderful to behold, the answer is written on the bottom of the slate. Not one in a thousand will suspect how it was done, if you are expert and make no perceptible movement. Always be willing for any one to test; and if they catch you, it will be your own fault, for it is very easy to fail and say the "conditions are unfavorable."

If any person desires to hold the slate with you, for a test, first contrive to draw or write something on the slate; and after turning, hold the pencil under the slate in position for rapping. Ask him to hold the side of the slate opposite you and pull against you. After numerous questions, to which you can rap answers, beg the spirit to write or draw something on the slate. Presently drop the pencil and have the other party take it out. He will think the writing was done while he held the slate. To ring a bell, show a "spirit hand," and perform many other wonders, suspend the slate by holding it between your left knee and the table, or any other way to free your hand. It excites more wonder to withdraw the slate with the pencil in its original position, after ringing the bell, etc. S. C. DODGE.

Chattanooga, Tenn.

REMARKS BY THE EDITOR.—This is a very clever way to imitate the spirit slate-writing, and for dark *séances* the trick would doubtless succeed very well. But the most accomplished spirit slate-writing mediums now discard the darkness, and do not touch the slate. A bit of a pencil is placed between a pair of slates which are laid on the table. No cloth. The gas lights, in full blaze, illuminate the scene, while the friction of the pencil on the slate may be distinctly heard; and on opening the slates, a written communication thereupon is found.

Prevention of Incrustation in Steam Boilers.

To the Editor of the Scientific American:

We have a backwoods way of cleansing scale out of boilers, down in this section, which may be useful to some of your readers. Introduce a few green hickory poles in at the man hole, and let them boil with the water a day; then blow out about one third of the water. Repeat the process for a few days, and the inside will be as clean as a society shirt, and the hickory poles as brittle as rotten wood. A.

Eutaw, Ala.

A FLOATING CANNON BALL.—In the pavilion of the Ministry of Agriculture, at Vienna, a floating cannon ball may be seen. Although weighing 50 lbs. it lies like a down feather on a silvery mass, consisting of pure quicksilver from the celebrated mines of Idria; 150 cwt. of this metal is exhibited in a large iron cauldron, offering a sight seldom to be met with, and on it rests the solid iron ball. It was interesting to observe the emptying of the quicksilver into its receptacle. The metal is very cleverly stowed away in bags of white sheep leather, specially prepared for the purpose, each containing 50 lbs. of the mass, the bags being tightly bound round the top, and then put into small wooden barrels, carefully bunged up. Formerly, this liquid metal, which penetrates easily all porous substances, was transmitted in wrought iron bottles of very expensive make.

ELECTRICAL GAS LIGHTING.—A novel device for lighting gas by electricity, lately patented, is made as follows: A glass cup is immersed in liquid; and when the gas is turned on, it enters under the cup and lifts the same, thereby establishing connection with a battery which heats a platinum wire placed over the burner, and thus ignites the gas. Mueller and Meier of Hanover, Germany, are the inventors.

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ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

For the computations in the following notes, I am indebted to students. M. M.

Positions of Planets for July, 1873.

Mercury.

Mercury rises on the 1st of July at 6h. 18m. A. M., and sets at 9 P. M. It is not at its greatest elongation from the sun until the middle of the month; but as it then has a lower altitude at meridian passage, it cannot be so well seen as earlier in the month.

On the 31st it rises at 6h. 46m. A. M., and sets at 7h. 48m. P. M.

Venus.

Venus was at its greatest brilliancy on the 10th of June, at which time it was easily seen at noonday, and a glass of low power showed it as a beautiful crescent.

In the first half of July, it will pass the meridian a little before nine in the morning, rising on the 1st at about 2 in the morning, and setting at near 4 P. M. On the 31st Venus rises at 1h. 37m. A. M., and sets at 4h. 13m. P. M.

Mars.

Mars rises on the 1st at 30 minutes after noon, and sets a little after 4 in the morning. On the 31st it rises at 1h. 10m. P. M., and sets at 11 P. M.

Mars is easily known by its ruddy light; it passes the meridian in July before sunset, and can be seen in the southwest after twilight. But little can be seen of its peculiarities with a small telescope, although a powerful one will show very decided markings on its disk.

Jupiter.

Jupiter is still conspicuous in the evening sky among the stars of *Leo*. On the 1st of July it rises at 8h. 39m., and sets at 10h. 12m. On the 31st of July it rises at 7h. 12m., and sets at 8h. 28m.

It is much less favorably situated for observation than in the winter, and very few of the phenomena of its satellites are visible in this locality for the whole month.

Saturn.

Saturn is more favorably situated for observation, but it is so far south that it does not reach, when on the meridian, an altitude of much more than 27°. It will be best seen at midnight on the 22d of July. It is among the stars of *Capricornus*, rising on the 1st of July at 8h. 48m. P. M., and setting at 6h. 14m. the next morning.

On the 31st Saturn sets at 4h. 13m. in the morning, and rises again at 6h. 43m. P. M.

Uranus.

Uranus is still among the stars of *Gemini*, and is very unfavorably situated for observation, rising in the morning and setting at 9 P. M. on the 1st of July, and at 7h. 7m. on the 31st.

Neptune.

Neptune rises between 12 and 1 A. M. on the 1st of July, and sets a little before 2 P. M. On the 30th it rises at 10h. 39m. P. M., and sets at 11h. 46m. A. M., on the 31st.

Meteors and Sun Spots.

Meteors were frequent on May 1, but have thus far (June 18) been rare in this month. It has also been a very remarkable period for the absence of sun spots. No spot could be found on the sun's surface (a glass of low power being used) from June 13th to June 17th. On June 18th a very small one was perceived.

New Planets Discovered in 1872.

Since the beginning of last year, twelve small planets have been discovered, as follows:

Peitho, discovered at Bilk, by R. Luther, March 15.

A not yet named planet, discovered at Ann Arbor, Mich., by Watson, April 3.

Lachesis, discovered at Marseilles, by Borelly, April 10.

A not yet named planet, discovered at Ann Arbor, by Watson, May 12.

Gerda, *Brunhilda* and *Alcestis*, discovered at Clinton, N. Y., by C. H. F. Peters, the two first on July 31, and the last on August 23.

A not yet named planet, discovered at Paris, by Prosper Henry, September 11, and two others, at the same observatory, by Paul Henry, November 5.

A not yet named planet, at Ann Arbor, by Watson, November 25, and another at Clinton, N. Y., by C. H. F. Peters, on February 5, 1873.

Railways of Massachusetts.

Massachusetts has today invested in railroads one hundred and forty million dollars, of which eighty-one million is stock and fifty-nine million bonds, and there is one mile of road to each four and three fourth square miles of territory. This is a greater development than in any other portion of United States, and equals the average of any country in Europe. The average cost per mile is $51,250, and, adding eqiupment, $58,125. The gross earnings last year were over $30,000,000, and the cost of operating 72·2 per cent. The average dividend on stock of paying roads was 8 per cent.

A Cheap Fire Alarm.

J. N J. says: Take an old gun or pistol; put a heavy charge of powder in it, and put it in the most dangerous place in a house or barn (near the rafters in the latter;) and if the building shonld take fire, it would immediately give the alarm, and thus might save many lives and much valuable property.

A STEAM wagon is to run from Nashville to Pulaski Tenn., commencing regular trips in October next.

NOTES FROM THE VIENNA EXPOSITION.

The bird's eye view herewith presented of the vast building erected in Vienna will convey as good an idea of the magnitude and splendor of the World's Fair of 1873 as is possible in so small a space. The site chosen is the Imperial Park or Prater, along one side of which extends the new channel of the Danube, while on the other runs the Danube canal, which separates the Park from the city.

The central rotunda, with its conical roof, occupies the most prominent position in the view presented. It springs from the ground, a circular façade of piers of no less than 426½ feet in diameter, with Roman-Doric columns at either side, and connecting arches filled with glass. Within this is a gallery 50 feet wide, covered with its own roof, while above rises the great arcaded circuit. The large lantern seen above the roof is 105 feet in diameter, and is surmounted by a second lantern and cupola fully 300 feet above the ground. The rotunda stands in the middle of the grand quadrangle, which is 755 feet square. The vast central gallery or spine is 2,985 feet long, width 82 feet, and its hight from floor to wall plate 52½ feet. The cross galleries are 250 feet in clear length by 49 feet in width.

The machinery annexe is a substantial brick building, shown in our illustration to the rear of and parallel to the central gallery. It is intended to be permanent, and after the Exposition will be used for mercantile purposes. The extreme length is 2,614 feet, and the width nearly 155 feet in the clear. The side walls consist of brick piers, running up to the roof, with segment arching between, at a level to suit the side buildings. Ample means of lighting and ventilation are provided. Boiler houses are constructed at various points along the length of the building, and steam and water introduced from end to end.

The building faces the southwest. The thirty-two transverse galleries are for the reception of the lighter articles of industry, and the assignment of divisions to the different nations corresponds to their geographical situation, the extreme right or eastern division being given to India, and that to the extreme left or west to America. The gallery to the extreme left and front is occupied by the United States, and the gallery directly back of that by South America.

The Exhibition closes October 31, 1873.

THE EXHIBITION WATER WORKS.

The arrangement, as carried out, is the design of Professor Grimburg, and has for its object the supply of the fountains, hydrants, and fire engine reservoirs, the feeding of the boilers and the kitchens of the different restaurants, and also the sluicing of the water closets and other sanitary conveniences. The plan is as follows: For the supply of the high pressure water necessary for the fountains, hydrants, and water closets, a water tower, 138 Austrian feet high, was erected, this consisting of a reservoir of riveted boiler work, 24 feet in diameter by 20 feet in depth, supported on nine cast iron tubular columns, each 105 feet in hight, which stand on an octagonal pedestal of brickwork, 15 feet high. The columns are bound together and stiffened by means of wrought iron rings and diagonals; two of them serve as outlet pipes, while the third one, in center of the group, feeds the reservoir, which contains 8,000 cubic feet of water. This water tower furnishes about 18,000 cubic feet of water per hour, and supplies the fountains, nine in number, as well as 180 hydrants. It draws its supply from a well 18 feet wide and 22 feet deep, by means of a double cylindered horizontal steam engine of 100 horse power nominal.

Two of the larger fountains are fed by a separate apparatus, which serves also as a reserve to the water tower just described. The arrangement is rather peculiar, for there is no reservoir, the pumps forcing the water directly into the pipes which lead to the fountains. The plan is, says *Engineering*, an American one, and everything about it is original; the two engines, which are each of 50 horse power, work the pumps by direct action, without the intervention of cranks; as there are no crank axles, there can also be no eccentrics, and so the valves are worked by tappets. The well from which the water is drawn is in this case 12 feet wide by 20 feet deep, and has to furnish 6,000 cubic feet per hour.

The boilers and condensers of the machinery hall are supplied by another set of pumps, which are quite different from the two sets already mentioned. The system in this case is a sort of Norton's tube well on a large scale. Continuous iron piping is driven into the ground till water is reached, and then the pumps are attached to the heads of the pipes; thus no well is needed, and the water is sucked up through the pipes and delivered into a reservoir, which in this case is situated 18 feet above the level of the floor of the machinery hall. It will convey an idea of the requirements of a large exhibition in the matter of water when it is stated that the united length of the pipes connected with the waterworks in the Prater is about 12 miles.

BOILER ENGINEERING.

In respect to stationary boilers, the *Engineer* pronounces the display as disappointing and unsatisfactory. As regards size, the number of boilers of any importance is small. Nothing especially new is exhibited in this line, and little concerning the construction of the boilers shown can be learned, because they are so put up as to render it difficult and impossible to get at their dimensions with accuracy. Nothing is on exhibition to illustrate boiler construction, and this omission our cotemporary thinks is unfortunate.

THE AMERICAN FLAG.

The Austrians, in getting up a United States flag to adorn one of the transepts of the exposition building, left out all the stars, added two extra stripes, and set the flag as a signal of distress, that is, "Union down." So says a correspondent of the Boston *Advertiser*.

Clarke's Combination Lock.

We were recently shown, by Mr. W. F. Beasley, the agent of the Clarke Lock Company of Louisville, Ky., a very ingenious and novel form of combination lock, as manufactured by the above corporation. It obviates the necessity of a key, acts as a secure fastening upon any object to which locks are applied, and also serves, upon doors, drawers, etc., as a convenient knob.

The device principally consists of a number of tumblers arranged in longitudinal slides on the periphery of an inner solid metal cylinder. Enclosing the latter there is another cylinder, within the inner end of which are radially disposed a number of small steel projections which take against the inner extremities of all but a certain number of the sliding tumblers, and thus prevent the acting of the fastening mechanism. The outer ends of the tumblers extend through an exterior small circular plate upon which are letters or other marks. By suitable means the tumblers can all be drawn forward at once; then by pushing in certain ones (previously known by the letters or otherwise distinguished) by means of suitably arranged notches in their extremities, permitting the projections to pass, the lock can be turned and the bolt drawn or withdrawn. It is impossible to open the lock without pushing in the right tumblers. The combination, or relative position of the latter, can be altered by interchanging their positions in the slides of the cylinder, a process easily accomplished.

The invention cannot be picked, as there are no orifices giving access to its interior, nor can the projecting lock be rotated by a wrench. The combination can be readily actuated in the dark, it being merely necessary to feel for the proper tumblers which, projecting, are easily distinguished. The mechanism is simple and not readily thrown out of order; and the device, as a whole, appears of considerable merit, both in design and construction.

A New Telegraph Instrument.

Mr. G. M. Phelps, of the Western Union Telegraph Company has recently completed a printing Instrument, for the use of the Gold and Stock Telegraph Company, which is really remarkable for its ingenuity and compactness. This instrument works on one line wire, without local batteries, has two type wheels, one for letters and the other for numerals, with a device for shifting the impression instantaneously from one to the other, and is capable of working continually at the rate of forty words per minute. The whole affair is, perhaps, eight inches in diameter, and of about the same hight. Mr. Phelps may well take an honest pride in this creation of his mechanical genius, as it is, probably, the most elegant printing instrument ever yet produced. It is probable that this machine will, in time, be exclusively used by the Gold and Stock Telegraph Company for their work, as its speed of transmission is nearly or quite five times as great as the one now in use by them.

A Useful and Interesting Picture.

Messrs. Kimmel and Voigh, of Nos. 254 and 256 Canal street, in this city, publish a neatly executed lithograph which will doubtless prove an acceptable ornament on the walls of the houses of those to whom it is dedicated, the mechanics and tradesmen of the United States. The subject is a group of workmen engaged at their different occupations in the foreground, while the distance presents a view of a harbor with vessels, etc., and also of factories, railroads, bridges and other structures indicative of industrial pursuits. The picture bears the appropriate title "By industry we thrive—Progress our motto." It is of quite large size, and in execution is a fair specimen of recent advancement in the lithographic art.

Hampton Normal and Agricultural Institute.

There has recently been established at Hampton, Va., an institution for technical education, where employment is furnished to colored students who are unable to bear the whole of their expenses; and thus they are enabled to help themselves. There are now 200 scholars of both sexes, whose ages range from 14 to 25 years. They are employed on the farm of the institute, and in the printing office, sewing room and laundry which are attached to the establishment. But these do not afford sufficient occupation, and it is proposed to add some light manufacturing business. Mr. S. C. Armstrong, the principal, will be glad to receive suggestions on this subject from any of our readers.

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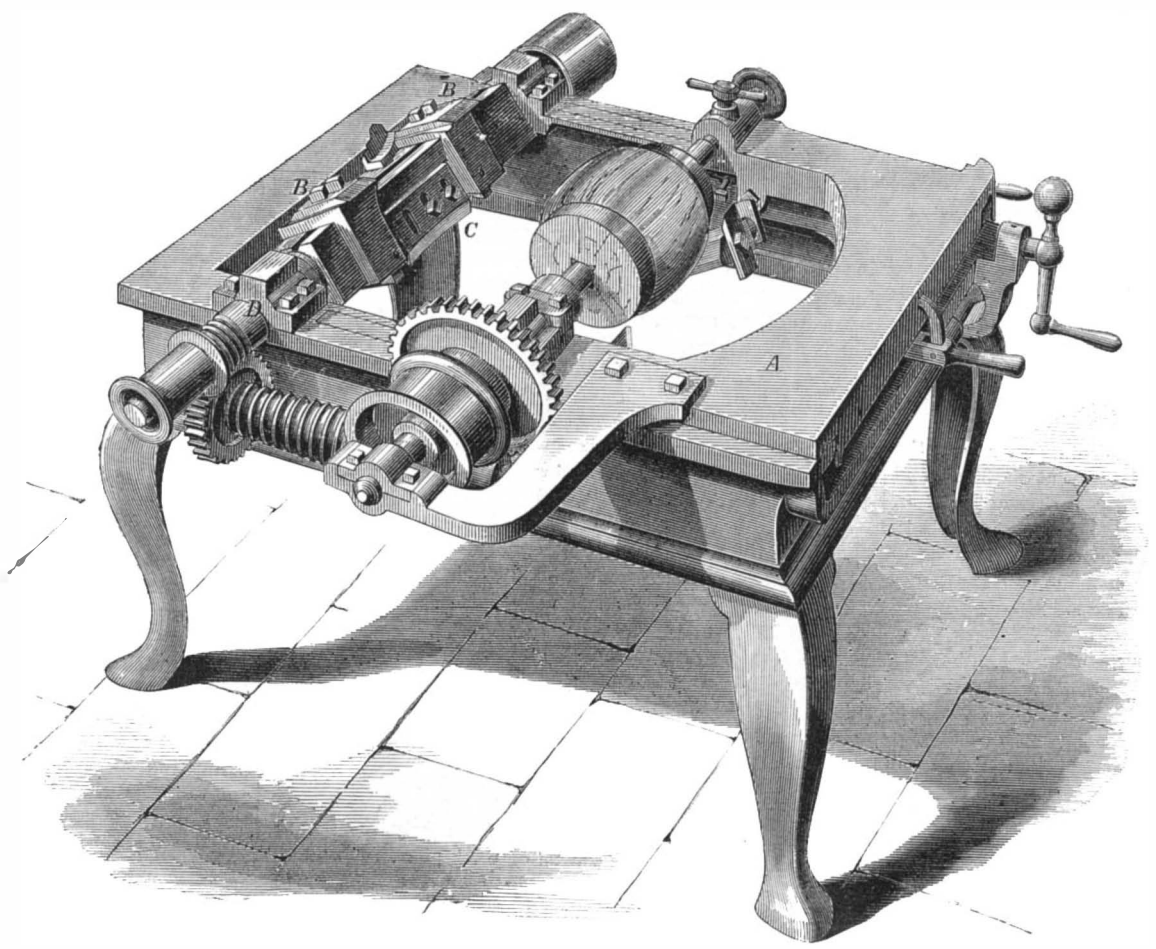
IMPROVED HUB LATHE.

The accompanying illustration represents an improved hub lathe for turning the hubs of vehicle wheels, which is at the present time employed at the American Hub and Spoke Factory at Schoharie, N. Y.

The logs of elm, white oak, and birch are first cut with circular saws into pieces of proper length, which, after being bored by suitable machinery, are, while still untrimmed, with the bark on, placed in the lathe. The block is fixed to a mandril arranged on the sliding carriage, A, on which, by means of the power transmitted by the two spirally threaded shafts and cog wheels, gearing with the cutting shaft as shown, it is drawn up to the cutting knives, B and C. The latter somewhat resemble plane irons, but are shorter and stronger, and their edges are shaped to correspond with the edge of a vertical section of the hub. They are four in number, for each machine, and are fastened by bolts to the sides of the strong shaft, D, which is some four inches square. This shaft, by the pulley represented, is caused to revolve very rapidly, the knives, B, cutting the straight portion of the convex surface at the ends of the hub, and the blades, C, forming the curved and grooved central portion. The diameter of the hub is regulated by putting a pin in a hole in the frame on which the carriage moves. The lathes are of different sizes, each being adjustable to work of varying dimensions. The smallest hubs made are six inches long by three in diameter, and the largest eighteen by twenty inches. At the factories above mentioned machines are in operation, turning daily from forty to fifty sets of the larger sized hubs, and from sixty to eighty sets of buggy hubs. The smaller sizes are finished, we are informed, in less than one minute, and the larger sizes in from one to two minutes. It is claimed that the work is performed better than it can be accomplished by hand, for the reason that the hubs are turned perfectly smooth and of exact uniformity in size and style.

For further particulars regarding sale of machines, rights, etc., address the owner of the patent, Mr. Treat Durand, Schoharie, N. Y.



RICKART'S PATENT HUB LATHE.

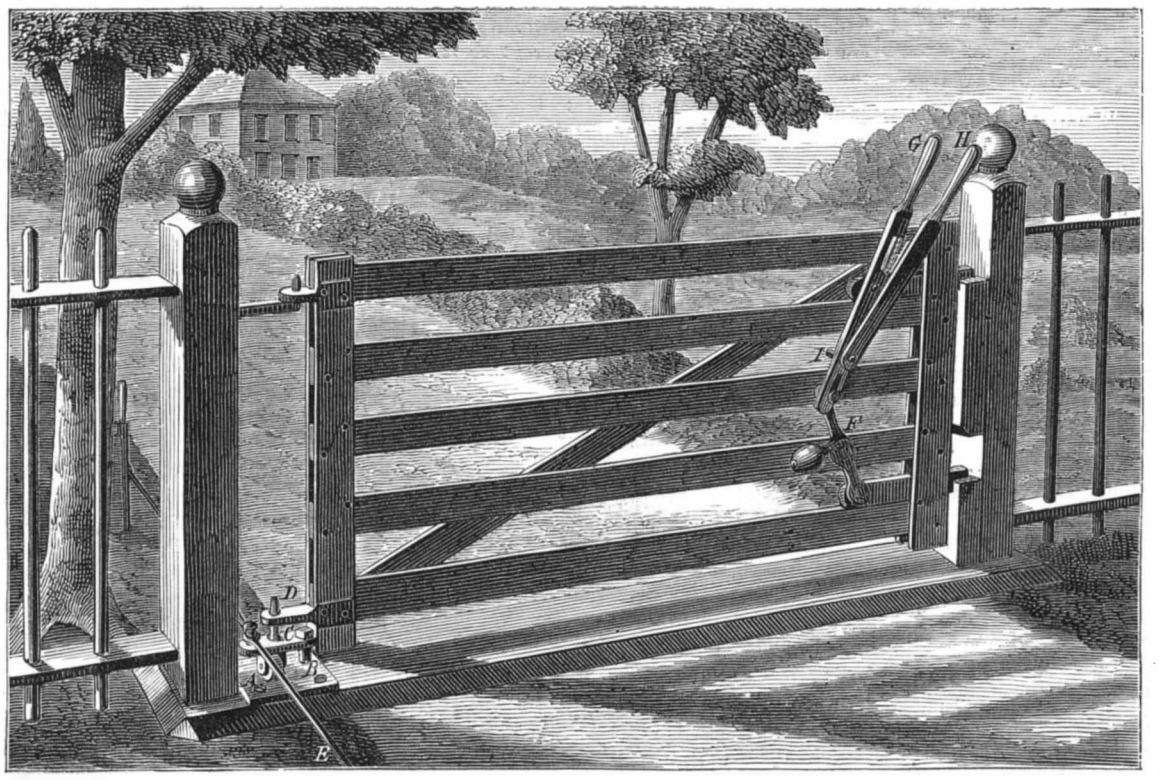
IMPROVED FARM GATE.

The invention represented in the accompanying engraving is an improved form of farm gate, with which is combined suitable mechanism for opening and closing, which is actuated by the operator some distance off, thus enabling a person to operate the gate without alighting from his carriage. The construction of the device is also such that it is not liable to be pushed open by cattle rubbing against it.

On the hinge post, and a little above the ground, is attached an inwardly projecting metal plate, A, to which, near its free end, is fastened a short stud, B. The latter serves as a pivot for the short arm, C, through the middle part of which passes a pin carrying a small wheel at its lower end. This wheel rests upon the plate, A, and is beveled so that it may readily cut through ice or snow that may pack upon said plate. The upper end of the pin enters the strap, D, attached to the gate. On the inner extremity of the short arm, C, is formed a projection to receive the eyes of rods, E, which extend from the gate in opposite directions, as shown, and communicate with hand levers suitably arranged. The latter are located at the side of the roadway at such a distance from the gate that the operator will be out of the way of the same when it swings open or shuts.

By this construction, when the inner end of the arm, C, is moved in either direction by the rods and levers just mentioned, the forward end of the gate, is raised, when the latter becomes unlatched and swings open in a contrary direction; or similarly, by actuating the lever in the opposite way, the gate may be caused to shut. The use of the forward end enables the gate to swing over snow, ice, or any other temporary obstruction. The two latches shown work in slots in the upper and lower parts of the forward crossbar and engage in the catches on the front post. The inner end of the lower latch is pivoted to a short lever, F, also pivoted to the gate, and connected similarly with a lever, G, which projects above the gate, and is readily operated. To the lever, F, is attached a weighted arm, which serves to throw the latches forward into position. H is another hand lever hinged to the lever, G, as shown, and having at its lower end a pin, F, which passes through an orifice in the latter. By this means the lever, G, cannot be worked to withdraw the latch without pressing the handle of the lever, H, inward, and so pulling out the pin, I. This device serves to prevent cattle from opening the gate by rubbing against it. The gate may be constructed of wire, iron, or any other suitable material.

Patented through the Scientific American Patent Agency, June 10, 1873. For further information, address the inventor, Mr. Cyrus E. Gillespie, Edwardsville, Madison Co., Ill.



GILLESPIE'S FARM GATE.

Alcohol in Bread.

In the ordinary process of bread fermentation, a portion of the sugar contained in the flour is decomposed and converted into alcohol. It has been heretofore supposed that by the heat of baking the whole of this alcohol was expelled, but recent experiments, made by Thomas Bolas, in London, indicate that a perceptible amount of alcohol still remains in yeast-raised bread after baking. The result of six experiments showed that one third of one per cent in weight of alcohol was obtainable from fresh baked bread; but the quantity of alcohol was much less in stale bread. From forty loaves of fresh bread, two pounds each, alcohol equal to one bottle of port wine may be extracted. From what is known as "aerated bread," or bread raised by mixture of carbonic acid gas with the dough, without fermentation, no alcohol can be extracted.

Fabricating Sulphate of Ammonia from Nitrogenous Waste.

A great quantity of nitrogenous substances, such as the waste or clippings of wool, skins, leather, horn, feathers, sponge, etc., are thrown away in various industries; these materials contain from six to fifteen per cent of nitrogen, and often enter into the fabrication of so-called organic manures. Their putrefaction in the soil is, however, a very slow process, hence it is of importance to obtain their nitrogen in the more assimilable state of ammonia. To effect this, M. L'hote proposes the following process:

When the substances are treated with a tenth part of solution of caustic soda, cold or slightly warmed, in order to avoid an ammoniacal production, they are not only dissolved but completely disaggregated. The viscous liquid so prepared is then mixed with slaked lime to form a pasty mass, which is introduced into a cast iron retort which communicates with receptacles containing chambers of sulphuric acid. Distillation is effected (at as low a temperature as possible, in order to avoid the dissociation of the ammonia) until all disengagement of gas ceases when the retort is brought to a red heat. When the operation is concluded, a white pulverulent residue is found, composed exclusively of carbonate of soda and quicklime, which treated with water, regenerates the caustic soda, which may be again employed. The sulphate of ammonia obtained is colored but may be purified by crystallization. If care be taken to operate on a homogeneous mixture of nitrogenous and alkaline wastes, all the organic nitrogen may be recovered in the state of ammoniacal nitrogen as the product of distillation.

Dissolving Action of Glycerin on the Oleates and on Sulphate of Lime.

M. Asselin has made a series of researches with the view of determining the solubility in glycerin (1) of soaps, made with metallic bases, of magnesia, and of lime; (2) of soaps (*sous-savons*) made with an excess of base; (3) of the sulphate of lime of calcareous waters.

Operating with pure glycerin of a density 1·114 he obtains the following results: 100 parts glycerin dissolve 0·71 soap, iron base; 0·94 soap, magnesia base; 1·18 soap, lime base.

A series of experiments upon the metallic and earthy soaps of the second class above mentioned, which impregnate the fibers of wool during carding, gave variable figures, due to the badly defined composition of the materials treated. A quick emulsion was obtained in water charged with glycerin, in a degree directly proportional to the recent formation of the soap. Sulphate of lime and, notably, the compound $(CaOSO_3)^2$ H O dissolved in the proportion of 0·957 in 100 parts of glycerin. Moreover, and contrary to the case with pure water, the ratio of solubility augmented with the elevation of temperature.

Considering these facts and the hygrometric properties of glycerin, the part which it should fill in woolen industries is clear. Its moderate employment will permit of the fabrication of tissues in plain tints and light colors which have been generally regarded as impossible to obtain, and the soft feeling which it communicates to the wool will give a real superiority to the cloth made therefrom, and will, by increasing the flexibility of the fiber, render it more durable.

DR. JOSEPH G. RICHARDSON, of Philadelphia, has discovered that the corpuscles of the saliva are migrating white blood-globules. So, the more you spit, the more you rob your system of blood. Smokers and tobacco chewers, take notice.

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Contents.

(Illustrated articles are marked with an asterisk.)

Alcohol in bread..... 6
Answers to correspondents..... 11
Astronomical notes..... 5
Beehive, life in the*..... 3
Business and personal..... 11
Fire alarm, a cheap..... 5
Fire ladders..... 7
Gate, improved farm*..... 6
Glycerin, the dissolving action of Hampton Normal and Agricultural Institute..... 5
Hub lathe, improved*..... 6
Imposition on the public, an..... 7
Incrustation, prevention of boiler 4
Inventions patented in England by Americans..... 9
Lifting jack, the Herculean*..... 2
Lock, combination..... 5
Mowing machine, a leaf from the early history of the*..... 2
New books and publications..... 9
Notes and queries..... 11
Patent congress, a..... 7
Patents, official list of..... 12
Patents, recent American and foreign..... 9
Peat for fuel, the preparation of*. 1
Picture, a useful and interesting.. 5
Planets discovered in 1872, new... 5
Psychic force on the slate..... 4
Railways of Massachusetts..... 5
Sand bars, new plan for removing 2
Scientific and practical information..... 8
Scientific prizes..... 4
Screw threads..... 7
Soundings, deep sea*..... 4
Steel making, the modes of..... 2
Sulphate of ammonia from nitrogenous wastes..... 6
Sulphur water on iron pipes, the effect of..... 2
Telegraph instrument, a new..... 5
Woman's rights, progress of..... 7
Vienna exposition, notes from the*..... 5

AN IMPOSITION UPON THE PUBLIC.

That meritorious inventions should receive protection by patents is generally conceded. Such has been the practice during nearly the whole of our national existence, and rightly so. The great benefits resulting to the country urge a continuance of a liberal policy towards inventors. On the other hand, we must not be unmindful of the fact that the numerous industries of the nation have a claim for protection against the creation of oppressive and improper monopolies. By this we mean that the grant of patents for old devices which have, for many years, been made, sold, and used by the public upon the faith that a patent neither existed nor could be granted, is both oppressive and wrong. There is neither law nor warrant for depriving the public of vested right, created by lapse of time and *laches* and abandonment on the part of the alleged originator, nor for the placing of the device exclusively in the hands of such alleged originator and his assignees.

But this is virtually what has taken place by the grant of a patent, bearing date April 29, 1873, to Joseph P. Woodbury, of Boston, Mass., for an alleged improvement in planing machines, consisting, in brief, of the use of yielding pressure bars in planing machines. It will be interesting to our readers to learn something of the facts of this extraordinary case, since, as it appears by the records in the Patent Office, this application for the patent was made as early as June 3, 1848, nearly twenty-five years prior to date of issue of the patent. The device was not only in public but common and almost universal use, on planing, tonguing and grooving, molding, and veneer cutting machines, between the time the Patent Office refused to grant the patent and its present date of issue, and this with the knowledge and acquiescence (presumptively) of the said Woodbury himself. In fact, it was a device mainly originated to get around the Woodward patents, so many years in litigation, and held by the courts to be an equivalent of it.

As against the equities of the public in this matter, it is contended that Mr. Woodbury made repeated efforts to obtain a patent after so filing application in the year 1848, and that his case was withdrawn in October, 1852, and the government fee of $20 was then returned to his attorney without the applicant's knowledge. But, granting all this, it still appears that, from October, 1852, until December, 1872, nothing further was done by the inventor towards obtaining a patent. Section 11 of the act of 1839 provided him with an appeal to the District Court of the United States for the District of Columbia; and he did not choose to avail himself of the remedy, in order to test his right as against that of the public. Was there ever a clearer case of intentional abandonment?

The statute under which this case was resurrected is the 35th section of the act of 1870. It, in general terms, permitted the renewal of rejected or withdrawn cases for a period of six months after the date of the passage of said act. But few interested were probably aware of this questionable piece of legislation until after the period and privileges had alike passed away, except the initiated few, who got the bill passed to admit of just such cases as the one under discussion. Congress, in reviving expired patents, invariably provides for the unrestricted use of machines made after expiration of the grant sought to be revived, and in use at the time of seeking the aid of that body for renewal of the patent, by excepting them as being lawfully made and used. By this Woodbury grant, however, existing machines are claimed to be tributary from date of the patent.

We venture to state that Congress had no such intention in the passage of the general statute under color of which this gigantic monopoly has been granted. Such a grant ought not to be sustained against any machines, whether built before or after date of its issue, because of the uninterrupted making and using having been so long vested in the public with the full knowledge and acquiescence of the alleged inventor.

Congress may, under certain circumstances, with propriety appropriate from the public funds a sum of money to an inventor, if it appears that he is raised by his invention to the dignity of a public benefactor; but it scarcely would, while guarding the worthy and diligent inventor, take from the community that which has unquestionably vested in it by reason of lapse of time and other causes. Such was not the intention of that clause of the constitution giving Congress power to enact laws to promote the progress of the useful arts; and such is against the spirit and fair interpretation of the laws already enacted in pursuance thereof.

The patent is but *prima facie* evidence of an existing right, and the whole matter will no doubt be thoroughly ventilated in the courts should any attempt be made to enforce it by legal proceedings.

SCREW THREADS---ENGLISH AND AMERICAN PROPORTIONS.

A correspondent recently asked for the standard proportions of the Whitworth screw thread. They are given below, as communicated by Mr. Whitworth, to the Institution of Civil Engineers, in 1841. We have also added the standard American proportions, which were published some years ago, and may be acceptable to some of our readers. They were communicated to the Franklin Institute, by a committee appointed for that purpose, in 1864:

PROPORTIONS OF THE WHITWORTH THREAD.

Diameter in inches,	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1
Threads per inch,	24	20	18	16	14	12	11	10	9	8

Diameter in inches,	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	2	2 1/4	2 1/2
Threads per inch,	7	7	6	6	5	5	4 1/2	4 1/2	4	4

Diameter in inches,	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5
Threads per inch,	3 1/2	3 1/2	3 1/4	3 1/4	3	3	2 7/8	2 7/8	2 3/4	2 3/4

Diameter in inches,	5 1/4	5 1/2	5 3/4	6
Threads per inch,	2 5/8	2 5/8	2 1/2	2 1/2

Angle of threads = 55°. Depth of threads = pitch of screws. One sixth of the depth is rounded off at top and bottom. Number of threads to the inch in square threads = ½ number of those in angular threads.

STANDARD AMERICAN PROPORTIONS.

Diameter in inches,	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1
Threads per inch,	20	18	16	14	13	12	11	10	9	8

Diameter in inches,	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	2	2 1/4	2 1/2
Threads per inch,	7	7	6	6	5 1/2	5	5	4 1/2	4 1/2	4

Diameter in inches,	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5
Threads per inch,	4	3 1/2	3 1/2	3 1/4	3	3	2 7/8	2 3/4	2 5/8	2 1/2

Diameter in inches,	5 1/4	5 1/2	5 3/4	6
Threads per inch,	2 1/2	2 5/8	2 5/8	2 1/4

Angle of threads = 60°. Flat surface at top and bottom = 1/8 of the pitch. For rough bolts, the distance betwen parallel sides of bolt head and nut = 1½ diameters of bolt + ⅛ of an inch. Thickness of head = ½ distance between parallel sides. Thickness of nut = diameter of bolt.

In finished bolts, thickness of head = thickness of nut. Distance between parallel sides of a bolt head and nut, and thickness of nut, are 1/16 of an inch less for finished work than for rough.

FIRE LADDERS.

Considerable attention has of late been directed to the subject of mechanical or folding ladders, and it is proposed to supply the fire department of this city with them. Of course the very best invention in this line is what is wanted; but if we may judge from the existing productions, there is still opportunity for ingenious people to work out new ideas. We are inclined to think that a steam machine of this kind, or a carbonic acid gas machine, might be devised and made to operate advantageously. At present the sliding ladders are all of them worked by hand power, by ropes and winches; and the aim has been, by diminishing weight, to render them easily operated; but this involves lack of stability. To be of real service, they must be made firm enough to resist danger of capsizing from ordinary causes, such, for example, as a blow of wind. In London they have been found defective in this respect.

During a recent trial in this city, another defect in stability was brought out. The ladders tried were those of the Uda pattern. It operated quite successfully in the facility with which it could be run up to a hight, bearing a man with hose pipe, mounted on the summit. But when the water was let suddenly on, the ladder began to straighten perpendicularly and was on the point of toppling over backward, when chief engineer Bates, of Boston, rushed forward and with a pocket knife opened the hose pipe, thus instantly reducing the water pressure and saving the fireman's life. It is evident that stability, under the force exerted by sudden application of a head of water to the hose pipe, is another quality that the coming fire ladder must possess.

The subject is an important one, and whoever can devise a first rate implement will render an important service to his fellow men.

PROGRESS OF WOMAN'S RIGHTS.

Miss Anna Nichols, of Massachusetts, has recently been appointed an assistant examiner in the Patent Office. The lady has for some time very creditably fulfilled the duties of clerk; and on the occasion of some vacancies in the examinerships, she was one of several ladies who competed for places. All of the candidates were subjected to a general scientific examination as to their capabilities for the position, and four ladies passed the ordeal with much credit. The Commissioner, however, concluded to appoint only one of them for the present, as a sort of experiment.

There are few duties connected with the operation of the Patent Office but may be efficiently performed by intelligent women. It is all indoor work, mostly of a fixed, clerical nature, for which petticoats are admirably adapted; and if the Commissioner would make a more general use of them, he would set free a large number of pantaloons to be usefully employed in developing the more direct outdoor industries of the country, for which men are, by nature, so especially prepared.

At Canandaigua, in this State, Miss Susan B. Anthony, who insisted that she had as good a right to vote as any other man, and who did vote at the last election, has been tried and, we regret to say, found guilty, and fined for violating the law. Judge Hunt decided that, although women were entitled to the general rights of citizens, there were certain special privileges which the law of New York, as it stands, did not give them, one of which was the privilege of voting. The law must, in the opinion of Judge Hunt, be changed before our feminine fellow citizens can enjoy themselves at the ballot box.

In the meantime, the Commissioner of Patents having wisely decided in favor of the eligibility of women as patent examiners, we shall hope to see his decision sustained and ratified by the appointment of Miss Anthony as his successor when he shall retire—and that day, we understand, is not far distant. The lady in question is a female steamboat, so far as untiring energy and useful capacity are concerned. She is, undoubtedly, competent to manage a dozen or two of sleepy institutions like the Patent Office. We nominate, for Commissioner of Patents, Miss Susan B. Anthony, of New York, and Miss Anna Nichols for Assistant Commissioner.

A PATENT CONGRESS.

It will be remembered that, when the prospectus for the present exposition at Vienna was announced, the Austrian government appealed to the United States, requesting that a full display of the new and ingenious productions of this country might be supplied.

We took occasion to point out the hindrances to a compliance with the Austrian request, and showed that, owing to the illiberal nature of the Austrian patent laws, American inventors could not obtain proper protection for their new improvements in that empire; and that unless better security could be immediately assured to our citizens, they would be likely to take but little share or interest in the exposition.

The result has fully justified our interpretation of the feelings of American inventors and manufacturers. The exhibit from this country, though good in quality, is scanty as compared with what it undoubtedly would have been, had the Austrian government been a little more compliant in respect to inventive protection. Instead of granting protection to Americans, all that the Austrians could be induced to do was to agree to favoring the assembling of an International Congress for the purpose of talking over the subject of patent laws in general, and the propriety of promoting the enacting of uniform patent laws in all European states.

This Congress is to meet in Vienna during the present summer, and the President has recently appointed, as a special delegate from this country, the Hon. J. M. Thacher, now Assistant Commissioner of Patents. This appointment is an excellent one. Mr. Thacher is a gentleman of ability, and his extended official experience will enable him to present the clearest explanations of the working of our patent system, and the needs of our inventors in respect to patents in foreign countries.

The Department of State, in officially notifying us of the appointment of Mr. Thacher, requests our views upon the points accompanying the following letter:

DEPARTMENT OF STATE,
WASHINGTON, June 17, 1873.

Messrs. Munn & Co., New York city.

SIRS:—An International Patent Congress is about to be held in Vienna, at which it is proposed that the United States be represented. In order that the interests of American inventors and manufacturers may be properly represented thereat, information is desired on the subjects of inquiry subjoined hereto.

Will you have the goodness to answer the several inquiries, or such of them as you may think proper to reply to, and return your answer to Hon. J. M. Thacher, Acting Commissioner of Patents, Patent Office, Washington?

As it is understood that the Congress will convene early in August next, it is very desirable that your answer may be received by Mr. Thacher before the first of July. I have the honor to be, Very respectfully yours,

HAMILTON FISH.

SUBJECTS OF INQUIRY.

1. Is the protection of inventions by patents just and expedient, and, if so, on what grounds?
2. To whom and for what should patents be granted?
3. Should the grant depend on preliminary official examination?
4. What limitations are proper, if any, as to manufacture of the patented article, or payment of additional fees?
5. Should a distinction be made between home and foreign applicants, and, if so, what?
6. What has been the influence of patents on manufacturing interests in this country? Examples.
7. If a manufacturer, how is your special branch affected by patents?

Statistical, as well as general information is desired, and also suggestions in relation to any other matter connected therewith.

REMARKS BY THE EDITOR.—Each of these questions would form the subject of an elaborate essay, which at present we cannot undertake. We shall leave their extended discussion to our various readers. The Secretary of State is desirous of drawing out as general an expression of views as possible.

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We suggest to those who take part in the discussion that they send us copies of their remarks, with the understanding that such portion thereof as the editor approves may be published in the SCIENTIFIC AMERICAN.

We will now give as briefly as possible some of our views, suggested by the enquiries above offered:

1. A patent is a private monopoly, which is a species of tyranny, an infringement of equal rights, and therefore untenable on the ground of justice. The invention by an individual of a new device by which his fellow men are benefitted does not entitle him, by any process of natural right or natural justice, to be a monopolist over his fellows, in respect to such article. On the contrary, every man in every community is bound by the strongest natural obligations freely to contribute his best powers of mind and body to promote the common welfare. Patents are therefore granted upon the ground of expediency, not of justice.

2. For the purpose of encouraging or quickening the growth of the useful arts, and spreading among the people a practical knowledge thereof, so that all who desire may find employment and profit from the new forms of industry, articles or processes thus brought out, it has been found expedient to grant patents for a limited period. Patents should therefore be issued for every new and useful article, process, device or manufacture, and, obviously, should be granted only to the original and first discoverer.

3. The grant of a patent is simply the issue by the government of a stamped receipt or piece of paper certifying that the holder has deposited a proper description of his invention, which, if new and useful, entitles him to a special monopoly thereof during the term of the patent.

To give occular importance to these documents, the ancient governmental custom was to write them on skins, attach great seals and ribbons thereto, and otherwise make an official fuss over the same. In England the skin and the big seal are still employed. The inventor, on filing his specification, receives the skin of a sheep, on which is printed a long rigmarole about "Victoria by the grace of God, Queen," etc. The document is signed by His Highness This, and My Lord That, and stamped with an immense seal of wax, one pound in weight, put up, for security, in a round tin box.

In this country we have, within a few years, abandoned the use of skins, high sounding words and other paraphernalia in connection with the issue of patents, but we contrive to make fuss over them in other ways.

The Commissioner of Patents must go through the formalities of an official examination as to the novelty of the invention, which consumes a deal of time and subjects the applicant to great inconvenience, delay and expense. This examination is of no real use, because, after all, it is the Court that decides whether the invention is new and useful.

The process of official preliminary examination at the Patent Office is attended with a variety of troubles, expenses and difficulties.

(a.) It involves the employment on the part of the government of a large number of officials, for whose support, and the materials they consume, the inventors, who are mostly poor persons, are heavily taxed.

(b.) It involves the employment of examiners to revise and correct the mistakes of assistant examiners; and of appeal boards, to revise and correct the mistakes of the examiners.

(c.) It involves the time and energies of the Commissioner of Patents, in the hearing of appeals from the appeal board, to revise and correct the decisions of such board.

(d.) It involves the time and labors of the District Court in hearing appeals from the decisions of the Commissioner of Patents, for the purpose of revising and correcting the decisions of the Commissioner.

(e.) It involves the employment, and support by the inventors, of an army of lawyers and agents, for the purpose of explaining law points to the Patent Office officials, pointing out to them the mistakes they have made in their examinations and decisions, obtaining the correction of such mistakes, putting in amendments to suit the whims of examiners, preparing, arguing and attending to appeals, etc.

(f.) In many cases, the applicant for a patent, unable by writing to explain away the objections brought by the Patent Office examiner, is obliged to travel in person from some distant part of the country to Washington, and then employ the help of a solicitor to assist the official in seeing and rectifying the official mistake.

(g.) Inventors are thus obliged to employ and support two distinct corps of helpers, in order to obtain a certificate for a patent, which, when obtained, is of uncertain value, because the Patent Office may subsequently grant another patent for the same thing to another party, or the Court, on trial of the patent, may decide that the invention lacks novelty, and that the Patent Office made a mistake in its official preliminary examination.

If any body doubts the worthlessness of Patent Office official examinations, let them read such decisions as that of Judge Blatchford in the refrigerator patent case, reported in the SCIENTIFIC AMERICAN of June 28, 1873. In that case, the Patent Office not only examined, but re-examined, and re-examined its re-examination, and decided each time that the device was new, putting the parties concerned to the greatest trouble and expense through a series of years, only to have it pointed out by the court, in the clearest manner, that the official Patent Office examinations were nothing but blunders.

For every case of this sort actually brought into court there are hundreds that are never made public because the worthlessness of the Patent Office examination is detected by the lawyer before the suit has progressed, and proceedings are not begun or, if commenced, are at once stopped.

(h.) In other cases, where the inventor is entitled to a patent, he is rejected by reason of the stupidity and incapacity of the official examiner; and on account of poverty, unable to pay the expenses of further prosecution, the applicant is compelled to abandon his attempt to procure a patent.

In view of the foregoing considerations, we think that the grant of the patent should not depend on the preliminary official examination.

The Patent Office should be simply an office for the registration and issue of patents. The official examination should be simply clerical, the only requirements being that the specifications and drawings are executed in accordance with prescribed rules. This done, and the fees paid, a certificate of patent should be promptly issued to every applicant.

Let those who are foolish enough to pay fees for a patent on an old invention do so. The number will be small, and they will harm none but themselves.

The abolition of the official examination would simplify the business of issuing patents, greatly reduce the cost of obtaining them to those for whom alone they are intended, and would necessarily result in giving renewed development to useful improvements of every kind.

The official examination was formerly essential in the grant of a patent, for then only one copy of the patent existed, and all additional copies had to be made by the hands of scribes, just as the Bible was formerly copied and circulated. But the matter is now entirely changed and presents itself in a different aspect. The publication of the drawings and specifications of all patents, in the cheap, popular, and admirable style in which they are now issued by our government, renders the work of official preliminary examination at the Patent Office superfluous. The inventor may now readily supply himself, or get access to every patent ever issued, and so become his own examiner. His eye is always quicker to detect resemblances or differences than any official examiner can be, and he understands better than the official what ought or ought not to be claimed.

4. The idea generally prevails in Europe, and also to some extent in this country, that by the grant of a patent the government gives away to the inventor a valuable privilege, for which the receiver should pay high fees in money, or place himself under obligations to do certain other things, well nigh impossible. This, we think, is a false idea and should be discarded.

If there is any obligation conferred by either side, it is on the part of the inventor, who, for the paltry reward of a temporary patent, places the government in possession of his new invention, from which, in due time, by the spread of the improvement and the creation of new industries among the people, the government is strengthened, its taxable resources increased, and the wealth of the nation augmented.

The object of granting patents is to encourage men to study, experiment and find out new arts.

The *introduction* or manufacture of a newly discovered thing is a different kind of labor from that of invention.

The one is the exercise of mind upon matter.

The other is simply the manipulation of matter into known forms.

Hence the patent should not be issued with any limitations as to manufacture, nor should new fees be demanded.

It should be clearly understood that the patent, when issued, is the exclusive property of the inventor, throughout its entire term, issued to him in reward for his discovery. It should be subject to no official interference, liable to no taxes. This is the only straightforward, equitable and satisfactory method. The attempt to make manufacturers out of inventors as they do in Canada, Austria, and other countries, by nullifying the patent if the inventor fails to manufacture under his patent within a specified time, is an utter failure. The only result is to defraud the original inventor out of the money he paid to procure the patent, besides robbing him of all his rights under the patent.

5. No distinction should be made between home and foreign applicants for patents. What we need, as a people, for the promotion of industry and the supply of constant employment for our teeming population, is the greatest possible variety of new and useful arts and industries. Let us have these arts and industries, no matter where their authors live, gladly granting the cheap price of a patent certificate for their procurement.

6. The influence of patents on manufacturing interests in this country has been beneficial in the highest degree.

In addition to the ordinary productions made by the common appliances, the fabrication of patented articles by means of these appliances has vastly contributed to the wealth and prosperity of our manufacturing interests. Think of the enormous number of men, with engines, wheels, lathes, hammers, and ordinary tools of every kind, now constantly employed in the fabrication of patented articles. Add to this the extraordinary number of patented tools that have been given to our manufacturing interests by means of patents, whereby human labor has been rendered more powerful, more effective, and more economical, and the sum total of benefit thus derived will be marvelous.

7. We only manufacture the SCIENTIFIC AMERICAN, which has now been published twenty-eight years. It has been so favorably affected by patents, and by the increased desire for scientific information which the studying out of improvements produces, that its regular issue has risen from one hundred and fifty copies per week to almost fifty thousand copies per week.

OLD PROBABILITIES, the modern clerk of the weather, is about to establish a station on Pike's Peak. We shall be likely to know what is going on in the upper regions, for the Peak is 11,497 feet above the level of the sea.

SCIENTIFIC AND PRACTICAL INFORMATION.

NEW CHLORIDES OF PROPYLENE.

M. Reboul states that, in addition to the ordinary chloride of propylene, $CH^3—CH—Cl—CH^2Cl$, and methyl-chloracetol, $CH^3—CCl^2—CH^3$, already known, there are two others, namely: Normal chloride of propylene, $CH^2—Cl—CH^2—CH^2Cl$, and chloro-propylol, $CH^3—CH^2—CH\,Cl^2$.

PERILS OF SURGEONS WHILE OPERATING.

The *Bordeaux Medical* states that Dr. Marc Girard, an eminent surgeon of that city, has lately died from a prick of a pin. He was operating upon the shoulder of a patient for a wound in which mortification had set in, and in placing the last sutures he accidentally scratched his finger. The effects appeared trivial, and the hurt soon apparently healed, but shortly after again inflamed, the poison extending through the body, and a lingering death was the result. M. Declat states positively that there is no necessity for any ill effects as above being caused by inoculation of the blood of either a diseased patient or the cadaver, when so simple and sure an agent as carbolic acid will promptly and almost infallibly arrest them.

STEEL LOCOMOTIVE BOILER.

Engineering of recent date contains the following items regarding a new steel locomotive boiler, made at the Crewe works of the London and Northwestern Railway, from the designs of Mr. F. W. Webb. It is of the ordinary type and the barrel is made telescopic, the mean inside diameter being 3 feet 11 inches and the plates $\frac{13}{32}$ inch thick. The most noticeable peculiarity is the system of fire box construction, which consists of forming the front, back, and sides of one plate. A portion is cut out of the front and the plate is flanged back to receive the tube plate. The ends of the plate are made in a jump joint under the tube plate and secured by a welt on the outside. The plate forming the top of the fire box is flanged down on three sides, and is riveted to the side and back of the box and to the tube plate. In order to insure a good joint around the tube plate, a copper calking strip is introduced between the flanges, so that the joint can at any time be repaired from the inside of the fire box. A $\frac{5}{16}$ inch plate is used for the body of the box, and a strong plate, $\frac{3}{4}$ inch thick, for the tubes. The dome is formed of one piece flanged at the bottom. The cover is made from a flat steel plate $\frac{7}{8}$ inch thick, and is stamped under a steam hammer into the required shape, the stamping being done by two blows of the hammer. There are 178 tubes of steel, $1\frac{7}{8}$ inches outside diameter. The tensile strength of the plates employed does not exceed 32 tuns to the square inch, and they will stretch 25 per cent before breaking. The boiler was subject to a test, by hydraulic pressure, of 200 lbs. per square inch before leaving the works.

CLEANING GUNS WITH PETROLEUM.

Greasing a weapon with fats and oils does not entirely protect it from rust; the so-called drying oils get gummy and resinous, while the non-drying oils become rancid; and by exposure to the action of the atmosphere, acids are formed, and these attack the iron. These are some of the reasons why petroleum is to be preferred for this purpose. Petroleum, is as great an enemy to water as are the fatty oils; and hence, when a gun barrel is covered with a thin film of petroleum it keeps the water away from the metal which forms the barrel; the water which rests upon this film of petroleum evaporates, but the oil does not, and hence no rust can be formed. It is very essential, however, that the petroleum or kerosene employed be perfectly pure, for impure oil, such as is often met with in commerce, attacks the metal. Care must also be taken not to allow it to come in contact with the polished stock, as it is able to dissolve the varnish.

The gun is cleaned as follows: Each rifleman carries a tin flask of pure kerosene and a round brush, of stiff hogs' bristles, which fits the barrel of the gun. The brush is screwed to the ramrod. The gunner also carries some dry hemp or tow. When about to clean a gun, some tow is wrapped about the rod and enough petroleum poured upon it to thoroughly moisten it; it is then pushed in a rotary manner through the barrel and back a dozen times, and the hemp taken out and unrolled, and the upper and lower ends of the barrel rubbed with the clean part, after which it is thrown away. This removes the coarser portion of the dirt. The brush is then moistened thoroughly with petroleum and twisted into the barrel, running it back and forth at least a dozen times, thus loosening the dirt that is more firmly attached to it. The first operation is now repeated, except that the hemp or tow on the rod is left dry, and the rubbing with this must be continued in all directions as long as it comes out soiled. The use of wire brushes is objectionable for cleaning guns, as the numerous little steel points cut into the tube. Only soft tow, hemp, woolen rags, or the like, should be used, as the petroleum dissolves off the dirt sufficiently.

PURIFICATION OF LUBRICATING OIL THAT HAS BEEN USED.

We find the following details of a practical method for regenerating lubricating oils given in an Austrian paper: A wooden tub holding 63 quarts has a faucet inserted close to the bottom and another about 4 inches farther up the side. In this apparatus is placed 7 quarts of boiling water, in which are then dissolved $4\frac{1}{2}$ ozs. chromate of potash, $3\frac{1}{2}$ ozs. carbonate of soda, $3\frac{1}{4}$ ozs. chloride of calcium, and 9 ozs. common salt. When all these are in solution, 45 quarts of the oil to be purified is let in and well stirred for 5 or 10 minutes; after which it is left to rest for a week in a warm place, at the expiratton of which time the clear pure oil can be drawn off through the upper stop cock without disturbing the impurities and cleansing fluid at the bottom.

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NEW BOOKS AND PUBLICATIONS.

FLOW OF WATER IN RIVERS AND CANALS. By D. Farrand Henry, Chief Engineer of the Detroit Water Works. Detroit: W. Graham, 52 Bates Street.

This is an able treatise on a very difficult and interesting subject; and, written as it is by a competent authority, must be considered as an important contribution to our knowledge of hydrostatics. It was originally published in the *Journal of the Franklin Institute.*

THE AMERICAN NEWSPAPER DIRECTORY: containing accurate Lists of all the Newspapers and Periodicals published in the United States and Territories, and the Dominion of Canada and British Colonies of North America. New York; George P. Rowell & Co., 41 Park Row.

This valuable compilation is here issued in a new edition, and the information is carried down to the latest date, with the elaboration and accuracy for which the work is justly renowned.

THE COAL REGIONS OF AMERICA; their Topography, Geology, and Development. With Maps and Illustrations. By James Macfarlane, A.M. New York: D. Appleton & Co., 549 and 551 Broadway.

The coal supply of the world is now a most vital question, and the enormous deposits known to exist in our country have long drawn the attention of practical scientists to the best means of raising and making available for public use this indispensable commodity. Mr. Macfarlane's book is a collection of all the ascertained facts as to the geographical, topographical, geological, and other characteristics of the coal regions of the United States, and the commercial and economical relations of this immense wealth, classified for study and reference. We believe this work will be eminently useful to all interested in the question, and we recommend it as a trustworthy authority.

UNDERGROUND; OR LIFE BELOW THE SURFACE. By Thomas W. Knox, Author of "Camp Fire and Cotton Field," etc., etc. Hartford: J. B. Burr and Hyde. Chicago: J. B. Burr, Hyde & Co.

Under this attractive title, the author has collated much curious information concerning mines, caverns, borings, shafts, tunnels, diving and divers, volcanoes, prisons and dungeons, cellars, sewers, underground railroads, rapid transit and many kindred topics. It forms a book of light and entertaining reading, containing many remarkable and little known facts.

BURNS' PHONIC SHORTHAND, for Schools, Business and Reporting. By Eliza Boardman Burns. Published and for sale by Burns & Co., Phonographic Publishers, 33 Park Row, New York. Price $1.

Mrs. Burns, in the neatly printed volume above named, aims to supply to the public a work which shall be in every respect a self instructor. To this end, she has brought her long experience as a teacher of the art of phonography to bear in its preparation, and, by an excellent arrangement of printed keys to every page, careful and lucid explanation of the fundamental rules and a judicious selection of examples, has produced a book which will doubtless prove of great service. We may add here that the recent introduction of the postal card renders phonography a science which may be called even into greater practical utility than at present. On the back of one of the ordinary cards, a letter of considerable extent may be inscribed in phonographic symbols, thus not only saving postage, but preventing the perusal of its contents by the general public. For business and other large correspondence, phonography is a most valuable auxiliary, and any means which, like the volume under notice, has for its object the popularization of the science will be generally welcomed.

A CATALOGUE OF EIGHTY-ONE DOUBLE STARS. By S. W. Burnham, Chicago, Ill.

Mr. Burnham here gives the result of investigations by which he has succeeded in discovering 81 double stars, which are not noted as double in any former publications. The list, valuable as indicating the progress of astronomy in America, was published in the March issue of the *Monthly Notices* of the Royal Astronomical Society of England. Eighty of these double stars were discovered with a six inch Alvan Clark refractor.

REPORT ON A TOPOGRAPHICAL SURVEY OF THE ADIRONDACK WILDERNESS OF NEW YORK. By Verplanck Colvin. Albany: The Argus Company.

This report describes the work done under authority of the Legislature of the State of New York; and it contains much new, valuable and interesting information. Among many discoveries, we especially notice the fact that Whiteface Mountain, hitherto considered to rise to only 2,500 feet above the sea level, and consequently to be inferior to the highest of the Catskill peaks, is really 1,000 feet above those elevations. Mount Marcy, the center of the Adirondack range and the highest mountain in the State, is here correctly located, for the first time.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From May 31 to June 5, 1873, inclusive.

COLLAR AND CLASP.—A. Flatley, J. Marson, Brooklyn, N. Y.
CUTTING STONE.—G. Stacy, Nannet, N. Y.
ELECTRO-MAGNETIC ENGINE.—J. D. Wallace, New York city.
MAKING BOOT SOLES.—D. Mills, Brooklyn, N. Y,
MAKING WRITING INK.—J. W. Carter, Boston, Mass.
SAFETY VALVE BALANCE.—V. F. Lassoe, G. F. Meyer, Brooklyn, N. Y.
SEWING MACHINE TUCKER.—E. Bouillon, New Orleans, La.
SHEEP SHEARS.—A. S. McWilliams, Colusa, Cal.
STEAM ENGINE GOVERNOR.—J. M. Bottum, New York city.

Recent American and Foreign Patents.

Improved Cartridge Box.

Samuel McKeever, U. S. Army, Mobile, Ala.—This invention relates to the construction of that class of cartridge boxes which are made in two parts hinged together. The invention consists in making one part higher than the other so as to fold over at top and allow it to be latched; in a flexible connection and pivot rod across the middle to enable it to unfold easily and smoothly; and in putting the flap and button at the bottom of the box.

Improved Sewing Machine.

Friedrich Koch and Robert Brass, Brooklyn, assignors to John Boyle, New York city.—This invention consists in the improvement of sewing machines for heavy fabrics. An elbow lever is pivoted to a slotted block confined in a recess of the head piece. The presser shank passes through this block, and a gib is placed between the shank of the presser and the short arm of the elbow piece that also projects into the block. When the awl is about to penetrate the material its cam strikes a roller, turns the elbow, and through the gib and block the presser is held firmly in position, so that it cannot rise under the action of the awl. A combination of motions causes the awl to ascend through the throat plate, pierce the fabric held there by pressure foot, feed the same to the descending needle, which follows the receding awl and enters the hole from above, carrying the burr toward the interior of the fabric, producing an even surface.

Improved Cartridge Box.

Samuel McKeever, U. S. Army, Mobile, Ala.—This invention relates to the construction and arrangement of the parts which constitute a soldier's cartridge box. It consists in making the box in two parts that are pivoted together at the bottom so as to turn down and allow an important addition to the number of cartridges usually carried. It also consists in providing the movable part with a rigid cover and in making slots where this turns on the pivots of the other, so that it may be raised and lowered to bring the cover in place and admit of dispensing with the ordinary flap cover. It also consists in a novel mode of securing the pockets to the inside of box so that the cartridges can be placed in a convenient position for rapid removal by the soldier.

Improved Sewing Machine.

Eugene W. Beebe, Evansville, Wis.—This invention consists in the improvement of sewing machine feed mechanism. The feed plate is secured to one end of a crooked bar hinged to the plate, by which the forward and back motion is imparted to the feed plate through a lever, one end of which works between a stationary lug on said plate and a movable one. A vertical bar is pivoted at its lower end to a stand under the bar, and has a roller in its upper end on which the bar rests. It is connected by a rod with the lever, so that, at the time that said lever works the plate, it will work the bar. The bar swings with the lever the full measure of its movement and raises the feed plate, while the plate only moves a short distance. The bar is curved downward so that it will raise the feed plate up to the cloth just before the lever comes to the lug, so that when the plate is moved forward, after the lever strikes this lug, the plate will move the cloth; then, during the back movement of the lever and before it comes up to the lug to move the feed plate back, it will pull the bar and roller back along the curve, so as to let the feed plate fall away from the cloth. The length of the stitch is regulated by moving the adjusting lug along the plate with an adjustable screw.

Improved Wagon Brake Shoe.

Henry Seitz, Palmyra, Mo.—This invention has for its object to furnish an improved brake shoe, which shall be so constructed that it may be readily moved up as it is worn away by the friction of the wheel, and which may also be moved laterally to bring it into line with the rim of the wheel.

Improved Chandelier.

Joseph Kintz, West Meriden, assignor to Joseph Kintz, of Meriden, and P. J. Clark, of West Meriden, Conn.—The essential object of this invention is so to make a chandelier that the center and suspending rod can be trimmed permanently without putting the arms in place, to facilitate the packing for shipment, and so that when received by the purchaser the arms can be readily put in without disturbing the ornaments to any material extent. The invention consists of a hollow center piece, to which the arms are attached, made of a ring and a bottom and top of a cup-shaped form, which are screwed against the ring by nuts on the rod, and have flanges overlapping the edges to hold it in place. The arms are hooked to the top of the ring and confined by the flanges of the top and bottom parts. The top part is swiveled to a female nut, which is a part of the ornamental piece above the center, by which it is readily raised up from the ring to admit the hooks of the arms for attaching them, and then screwed down again to secure them. The ring is connected to the suspending rod by bars projecting from the rod radially, to prevent turning.

Improved Case for Law Blanks.

C. Irvine Walker, Charleston, S. C.—The object of this invention is to furnish to lawyers, clerks of courts, notaries public, and others a law blank case, which contains a number of leaves for the adjustment of different law blanks, to be available for ready use, and provided with an index for easy reference. The blanks or forms are thus preserved in good order, free from injury, and by their convenient arrangement a great deal of time is saved. The invention consists of a book composed of leaves of binders' boards, or wood, metal, or other suitable material. On each side, or on one side only, of the leaves, at the corners, are strips for confining the blanks and for holding them flat against the leaf. The strips are placed diagonally across the corners and so prevent any slipping of the blanks. They are stamped in such a manner that the parts which pass over the blanks are bent up suitably so as to form an elevation for slipping the blanks under them; and they hold the blanks firmly in their place, keep them flat, smooth and clean, and make them easy of access. The lettering (or numbering) of the pages, with an index sheet in front, makes it an easy matter to find any blank which may be wanted. It is a most convenient arrangement for lawyers, court officers, and others keeping blank forms, and is far preferable to shelves, as it is more compact, and can be laid on the desk or table immediately at hand.

Improved Reversible Street Car.

William T. Jenks, Toledo, Ohio.—This invention has for its object to improve the construction of the improved street car, for which letters patent No. 135,277 were issued to the same inventor January 28, 1873, so as to make it more convenient in use and more effective in operation. The invention consists in the circle, constructed as described, the flanged segments, the rollers, and the guard, in combination with the car body, the truck frame, and the king bolt. By means of the king bolt the car body is pivoted to the truck frame, and the former is long, so as to allow the body to rise above the frame without drawing the bolt out of place. A guard brace is attached to the truck frame to hold the said bolt steady and in a vertical position while the body is being raised, turned, and lowered. A circle, the parts of which toward the sides of the car body are horizontal, is attached to the said car body. The parts of the circle toward the ends of the car body are also horizontal, and are at a lower level, so as, when the car body is parallel with the truck frame, to rest upon the central bar of said frame. Segments of circles are formed with side flanges upon their outer and inner edges, and are bolted through their outer flanges to the bars of the truck frame. In slots in the end parts of the segments are pivoted rollers, upon the faces of which the inclined parts of the circle rest. By this construction, as the car body is turned, the circle moves up upon the rollers, raising the car body above the wheels so that the said body can be conveniently turned; and as it comes into line in the reversed position, it again descends to its former level.

Improved Cotton Worm Destroyer.

Jack. Helm, Hochheim, Texas, assignor to himself and Charles Tim, of same place.—This invention relates to a new machine for removing the destructive cotton worms from the cotton plants without injury to the plants and for destroying the worms. The invention consists in the arrangement of a movable frame, which is by animals drawn over the fields to straddle the rows of cotton, and which is provided with brushes for sweeping the worms from the plants, and with jointed bottom pieces or slides, which crush them on the ground.

Improved Dental Drill.

Jonathan W. Baxter, Vevay, Ind.—This invention has for its object to furnish dentists with a rotary drill adapted to be operated by the hand through the medium of a worm, a toothed driving wheel, and pawl mechanism. The wheel is turned by a pawl crank and a push pawl, the latter extending down through the bottom of the case, and having a finger piece on the lower end to be acted on by the middle finger of the same hand by which the machine is held, which pushes it up and turns the wheel, and a spring pushes it down again.

Improved Milk Boiler Alarm.

Samuel Mangold, New York city.—The object of this invention is to prevent boiling milk from becoming scorched by boiling over; and the invention consists in forming a milk boiler alarm which, when the milk is about to boil over, will cause a bell to ring, so that the cook may be informed and remove the milk from the fire. This invention is carried into effect by the use of a float, connecting with an elevated bell in such manner that, when the boiling milk rises to the top of the float and enters or weights it, the bell will be released and ring the alarm.

Improved Harrow.

Thomas M. King, Murfreesborough, Tenn.—This invention consists of two harrows, the frame of each being formed of a straight bar and a semi-circular bar, and attached to a beam by bolts, so as to be adjustable at various angles to each other.

Improved Mechanism for Operating Screw Propellers.

James Wixcoxen, Russellville, Ill.—This invention consists of twin screws and propellers, each mounted on a laterally vibrating frame, wherewith is a horizontal drive wheel on a vertical axis, coinciding with the axis whereon the frame swings, and gearing with the propeller shaft so that the propeller and the rudder can swing laterally to utilize both the propeiler and the rudder for steering the boat, the said drive wheel being also geared with the crank shaft in the vessel for being operated. Twin screws and rudders are used, to have one counteract the other in respect to the tendency of the drive wheel to cause the propeller and rudder to swing around their axis in the application of the driving force. The two vibrating frames are connected together so as to act synchronously, and the chains of the steering wheel are connected to them to work them to steer the boat.

Improved Nut and Coffee Roaster.

D'Alembert T. Gale, Fort Wayne, Ind,—This invention consists in the arrangement, in connection with a nut-roasting cylinder, of an escapement wheel, clutch, pawls, and pendulum, in connection with a spring-driving mechanism, whereby an intermittent rotary motion is given to the roasting cylinder: the mechanism being so constructed and arranged in relation to the roasting cylinder that, in winding up the springs which constitute the motor, the roasting cylinder is revolved the reverse way, thereby giving the contents thereof a thorough mixing, avoiding burning.

Improved Combined Stop Cock and Check Valve.

Asa T. Waldron, Waterford, N. Y.—This invention consists of a combined stop cock and check valve, in which the water way of the hollow cock is divided by a partition with a hole through it, and a valve seat on the upper side, with a stem extending up into a hollow removable cap on the top of the cock, and having a coiled spring for closing it down on the seat, the partition being above the inlet port, so that the check valve prevents back flow. The construction is such that the check valve can be readily taken out at any time by removing the cap on the top of the cock to clean out sand and other matters collecting in the plug.

Improved Shaft Coupling for Earth Augers.

Thomas Urie, Corning, Iowa.—This invention has for its object to furnish an improved shaft coupling for well borers and other machinery. The shaft is made square, and in sections or lengths. Upon the lower end of the lower section is attached a boring tool. In each end of each section or length of the shaft is formed a tapering square hole or socket to receive the coupling pin, which is made square in its cross section, and tapering from its center toward each end, to correspond with and fit snugly into the holes or sockets in the ends of the sections of the shafts, where it is secured in place by set screws. This construction leaves the surface of the shaft smooth throughout its entire length.

Improved Filter for Water Cooler.

Charles Schneider, Newark, N. J.—The object of this invention is to provide an efficient filter for water coolers, by which not only the impurities contained in the ice may be excluded, but also impure and unhealthy pump or aqueduct water filtered in such a manner that the clear and limpid liquid is drawn off. The whole filter is constructed to be detachable for cleaning and refilling with charcoal or other absorbing material, as required. The invention consists of a cylindrical filter of wire gauze, having a detachable top and adjustable bottom. A conical spout, to be placed into the inside of the faucet of the cooler, closes the faucet and prevents thereby the escape of unfiltered water.

Improved Railroad Switch Signal.

John Cullen, Oxford, Miss.—The object of this invention is to improve the signals of railroad switches so as to insure greater safety in running the trains; and it consists in connecting, with the signal levers, reflectors by which the head light of an approaching locomotive will be reflected and the position of the signal indicated to the engineer. To warn the engineer of danger ahead, a reflector may be placed on the rear car of a train ahead, which it is believed would be an improvement upon the signal lantern now in use.

Improved Bed Bottom.

Nelson O. Wilcox, Omaha, Neb.—The object of this invention is to simplify, cheapen, and, at the same time, improve spring bed bottoms. Cleats at the end of the bedstead support spring slats. Cross pieces rest on the spring slats and support the middle slats. The spring slat is made in three pieces, with a supporting slat beneath. The pieces are connected by means of elastic bands made of rubber or equivalent material. The cross pieces are notched to the spring slats, and the middle slats are notched on to the cross piece. The spring slats are placed next the sides of the bedstead, and with this arrangement of the parts the middle slats are made to partake of the elasticity of the spring slats, and the whole to form a highly elastic and durable bed bottom, without the use of metallic springs or metallic fastenings.

Improved Horse Power.

Washington P. Emerson, Pleasantville, Ky.—This invention consists of a series of vertical shafts arranged in a circle with pulleys at the lower end, all in the same horizontal plane, in which the driving belt works. The horse is hitched to a belt working on pulleys. The upper ends have transmitting pulleys in different trains, from which the belts work on a central vertical shaft, which is speeded up and transmits the motion by a belt from a large pulley.

Improved Cultivator.

William T. Walker, Fontenoy Mills, Ga.—This invention consists in the arrangement of springs with the pivoted and stationary beams of a cultivator. The springs are secured to the fixed central beam and connected at their free ends with the pivoted and handled side beams by means of staples or other equivalent guides. By this construction, by operating the handles the side plows may be moved inward or outward, as may be desired, and together or separately, as may be required.

Improvement in Preparing and Packing Water Colors.

Edward L. Molineux, Brooklyn, N. Y.—In preparing these improved colors, sheets of cardboard or other substance, properly prepared in any of the well known ways to prevent them from absorbing the colors, are painted with one or several coats of color in a damp state, prepared with sufficient sizing. As the coats of color dry, other coats are added until a mass of color of the desired thickness has been formed. The sheets thus prepared are carefully dried, and cut into pieces of any desired size and form. The sheets, pieces, or tablets of color are then made into portfolios, albums, pocketbooks, or other convenient forms. In using these tablets the amount of color required is rubbed off with a brush moistened with water, thus dispensing with the use of slabs or tiles for grinding or rubbing the cake colors.

Improved Hay and Cotton Press.

William H. McBurney, Sacramento City, Cal.—This invention consists in an improvement of the operative mechanism for hay and cotton presses. A pair of long levers are pivoted at one end to strong posts near their upper ends, the said posts rising up from the platform a suitable distance from the front of the case. At the other ends said levers project through slots in the front of the case, and are connected by short links with the under side of the follower. These levers have a bar pivoted to them, the said bars being pivoted to the free ends of other levers, which at their other ends are pivoted to the platform and also to the bars. These latter bars are pivoted to the axis of the upper wheel of a pair of eccentric segmental wheels, arranged between posts so that the said axis and a strong block above are caused to rise by the turning of the lower wheel to force up the follower. By the short movement of the upper wheel, due to the eccentricity of its face and that of the lower wheel whereon it rests, a long movement is imparted to the follower in consequence of the arrangement of the levers and the connections; and in the last part of the operation when the resistance has greatly increased, a considerable measure of the power is transmitted through toggle-jointed bars, by which the leverage is so increased that the greatest force is obtained at the time it is most needed.

Improvement in Rolling Wire.

William Walton and John T. Fallows, Haughton Dale Mills, Denton, near Manchester, England.—This invention consists, first, in rolling two wires, round or otherwise, in the same groove, or in recesses formed in the circumferences of rollers, in order to produce at one operation two wires of the required section, angle, or other form. The invention consists, also, in making grooves or recesses of an angular or curved form in the circumference of one or both of the compressing rollers, the section of the grooves or recesses corresponding to the shape of the two angle irons required, so that, when the wires are compressed in passing between the rollers, each assumes the shape of half of the groove or recess. These rolled wires are particularly adapted for making wire cards, but they may be used for other purposes.

Improved Row Lock.

George C. Wilen, Philadelphia, Pa.—This invention consists in a bracket or bail hinged to the rail, or, rather, to a plate through which the row lock passes, so that the row lock is supported by two bearings instead of one and is kept steady and in working order.

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Improved Refrigerator and Mode of Cooling.

Jacob F. Schneider, Brooklyn, N. Y., assignor to himself and Philip Lenhart, of same place.—The object of this invention is to furnish to the public an improved refrigerator which cools and preserves the articles placed therein without the use of ice. The invention is based on the principle of reduction of temperature by evaporation of liquids; and consists mainly in the application of very porous plates placed in vessels filled with the liquid to be evaporated, and arranged at the sides and tops of the refrigerator. The liquid will gradually rise in the plates, and, being exposed by the porosity of the plates to rapid evaporation, will reduce the temperature in the inside of the box. The porous plates are connected, by strips, to the sides of the refrigerator. The lower parts of the plates are placed in boxes of suitable metal. The liquid used is preferably water, with a small addition of salt and saltpeter for decreasing the temperature and purifying the air. The porous plates are obtained by the mixture of clay, sand, sawdust, charcoal, pulverized glass, and a slight addition of sulphur. On forming and burning this composition, very porous plates are obtained, in which the liquid rises rapidly, which is necessary for this purpose.

Improved Revolving Rake Shoe.

Almerin J. Taylor, Rome, Pa.—This invention consists in securing the two sections of a rake shoe detachably, so as to bring the fulcrum directly under the rake head. The shoe is made in two parts, exactly alike, about eighteen inches in length, which are beveled off at one end for about six or seven inches. The parts are placed upon each other, long side to long side, with their beveled ends pointing in opposite directions, and are securely bolted together. In the adjacent edges are formed half round notches, which, when the said parts of the shoe are bolted together, form a round hole to receive and fit upon the rounded middle part of the rake head. The fulcrum is brought directly under the rake head. By this construction, as the rake is revolved to dump the hay, the other side of the shoe will come in contact with and will slide along the surface of the ground.

Improved Driving Rein Support.

Wm. W. C. Willson, Summit Point, West Va.—This invention relates to means for preventing the usually annoying practice, which belongs to all draft quadrupeds, of switching the reins out of their proper position and clamping them under their caudal extremities.

Improved Farm Gate.

Horace W. Mullennex, Alpine, N. Y.—This invention relates to gates which both turn and slide, and consists in the improved construction of the frame in which they slide. The gate when hung in the swiveled frames can be half opened, or more or less than half opened, by sliding it on the frames, and can then, or in any position on said frames, be turned and fastened at either end to the gate post.

Improved Spinning Mule.

John J. Dewey, Queechee, Vt.—This invention consists of a combination, with the carriage of a spinning mule, of gearing, arranged for facilitating the running of the carriage in by hand (first throwing off the driving belt and turning the spindles slowly) when the bobbins are full and ready to be doffed, so that the yarn may be wound a few times around the bottoms of the bobbins to fasten it, and then run down below the bobbins on to the spindles, so as to be held, when the bobbins are doffed, ready to be run upon the new bobbins. By this means it is possible to wind, upon the spindles, the packing of fine threads for holding the bobbins thereto by friction.

Improvement in Dyeing Madder Colors.

Frederick A. Gatty, Accrington, England.—These improvements apply to cotton fabrics and yarns printed, padded, or otherwise prepared with aluminous mordants for dyeing red colors with madder, garancine, extracts of madder, artificial alizarine, or other products of madder. In place of using cow dung, or any known dung substitute, for the operation commonly called dunging or cleansing, solutions of soap or solutions of fatty acids or resins are employed, combined with soda, potash, or ammonia, or their respective carbonates, or emulsions of oils, or the waste soap liquors of calico printers and Turkey red dyers. The object of using the ingredients named above in lieu of cow dung or dung substitutes is to combine a certain quantity of fatty resinous matter with the mordant in order to obtain brighter colors. By these means red colors similar to Turkey red are obtained without going through the tedious and expensive process of oiling.

Improved Puddling Furnace.

John Heatley, Harrisburgh, Pa.—This invention consists in a stove, placed n the center of melting chamber, and provided with inlet and outlet openings thereinto and therefrom; in the cover of a melting chamber arranged to rotate thereover and thus to carry around therewith the stirrers; in a bed vertically movable on a shaft, and provided with arc slots at each end, in which the stirrers are moved so as to give a double adjustment; in a bottom in which the metal is stirred, connected with the water in pan by intermediate heat-conducting bars; in a bar made in two or more pieces clamped together on shaft and journals of stirrer blocks; in a revolving cover, having a series of pendent fan blades; and in vibratory regulators applied to the stirrers. These features, taken together, form a very great improvement in puddling furnaces, not only rendering them capable of producing a better article of metal but in greater quantity.

Improved Iron Ore Separator.

Alexander Goodhart, Newville, Pa.—This invention consists in separating dirt from ore by drying them both together and then detaching the dirt by concussion. It also consists in a new mode of combining instrumentalities for drying the ore and dirt and for detaching the latter.

Improved Soldering Apparatus.

Wm. D. Brooks, Baltimore, Md.—This invention relates to means whereby the intense heat of the blow pipes is prevented from coming into to close proximity with the can by an intermediate rotary soldering tool; also to peculiarities of construction in the soldering tool; also to a novel mode of constructing the bolt which couples together the sections that embrace the water, gas and air chambers; also to a novel mode of constructing a rotary tool intended to solder a cap to the body of a can without wasting the solder and smearing it on cap or head; and also, to a method of constructing and putting together the gas and air chambers so that they can be readily separated in order to substitute larger or smaller burners.

Improved Fire Place.

Frederick Proudfoot, Toronto, Canada.—This invention consists chiefly of a fire place, which is provided with an open front and back and a single fuel or fire chamber to enable it to be inserted into partition walls of rooms for heating two adjacent compartments, and so arranged that it can be readily converted into a single or one front fire place. The invention further consists in the provision of a suspended fire or fuel basket located in the chamber of the fire place, and possessing a tubular shank which is adustable on a stationary tubular post, said basket being also provided with counterbalance weights to cause the same to be elevated into the chimney when the fuel is removed. The invention also consists in the use or combination with such a fire place of a steam generating boiler or tank, and pipes to convey steam to the fire basket for aiding the combustion of the fuel, while the surplus steam is conveyed to the dome for radiation, and finally to the chimney.

Smoke and Gas Consuming Furnace and Steam Generator.

Oliver W. Ketchum, Toronto, Canada.—This invention consists of a steam boiler with a vertical air-tight cylinder situated in the boiler and containing the fuel, which cylinder is flared towards the bottom and is closed at the top with an air-tight door opening inwards. The invention also consists n providing the boiler on the inside with concave projections running through its length in both sides above the pipes referred to and above the water line, so that the ebullitions of water above said pipes and caused by escape of gas are thrown back into the middle of boiler. It also consists in providing the dome of boiler with concave pieces of iron resting one upon the other, constructed with spaces between each and between the sides of dome to act as additional deflectors.

Improved Twisting and Doubling Machine.

Albert H. Carroll, Baltimore, Md.—This invention relates to means by which the twister, flyer or spindle or twist plate of the twister and feed rolls of same twister or cord-making machine may be made to cease their operation automatically whenever a thread is broken or full number of ends ceases to be supplied to the rollers.

Improved Steam Engine Governor Valve.

Elijah Ware, Norfolk, Mass.—The invention consists in the improvement of governor valves. Openings are made in the sides of the valves, which allow the steam to enter the chambers in the shells. There may be four of these openings and chambers, so as to balance the valve when it is made of large diameter. An arm is attached to the valve stem and connected to the governor, by means of which the valve is partially revolved. The valve is made slightly tapering in the shell, so that any wear may be taken up readily and the valve made steam tight. The valve will work equally well in either direction, and the steam may enter and be discharged from either of the openings. Plug screws are provided, by the removal of either of which the position of the valve can be seen so that it can be varied or set by sight. A small hole is made (one or more) in the top of the valve to equalize the pressure.

Improved Mold for Forming Building Blocks.

Andrew Derrom, Paterson, N. J.—The invention consists in an improved construction of a concrete or brick mold. To form the blocks a mold or box, of the proper size and shape, is constructed, with the sides hinged together so as to allow the box to be thrown entirely open. When the box is in use, the sides are held in place by suitable fastenings. A false bottom is arranged by which to remove the block from the mold until it is hardened. After locking the sides of the box together, a layer of stone is placed in the box, and liquid cement is poured in until all the crevices between the stones are filled. Another layer of stone or brick is then inserted, more cement added and so on until the box is filled. The cement will set sufficiently in a few minutes to allow the box to be turned so as to bring the false bottom down, when the fastenings may be loosened and the sides turned down. The block may then be removed by means of and on the false bottom, and set away to dry, while the box is ready to be used again.

Improved Machinery for Spinning and Doubling.

Thomas Henry Rushton and Robert Tongue, Bolton, England.—The object of the first part of this invention is to simplify the gearing of band and self-acting mules for producing the after stretching and for giving motion to the front roller during the twisting at the head; also to render self acting mules suitable for spinning fine numbers. Secondly, in an improved arrangement of mechanism for locking edge falless and for unlocking the long lever forming parts of a self acting mule.

Improvement in the Manufacture of Gas.

Frederick A. Sabbaton, Troy, N. Y.—This invention consists in the adaptation or application to a gas retort of a combined steam and air injector, whereby the tar from the hydraulic main or other gas depository is, in fine spray, forced under the retort and consumed. The injector is applied for the purpose of consuming the coal tar or other gas deposit produced in the manufacture of gas, thus saving a large amount of fuel used in heating the retort, and so arranged that the coal tar or other gas deposit from the hydraulic main or other place of deposit is carried direct to the injector, which is compactly arranged above the furnace door. By means of a current of steam, a spray of tar or other gas deposit, in combination with atmospheric air, is forced into the fire box or furnace, and there consumed.

Improved Stucco Cornice.

Andrew Derrom, Paterson, N. J.—The object of this invention is to facilitate the construction of cornices or other ornaments of plaster, cement, or other composition at places distant from those at which such ornamentation is to be finally and permanently applied. At present it is an item of considerable expense and some inconvenience to form ceiling and panel ornaments of plaster or similar substance, chiefly because the ornaments must be formed on the spot on which they are to remain, thus exposing the artisan to every inconvenience of angles, high ceiling, etc. The invention consists in constructing such ornaments on and around a frame work of wood or metal, so that by such frame work the brittle or fragile substance of the ornaments will be strengthened. Thus made, the ornaments, whatever their length or size, can be safely transported from place to place, and firmly attached by screws, pins, or other means to the walls or ceilings and each other.

Improved Door Check.

George E. Rittenhouse, Akron, O.—This invention is an improvement in the class of devices adapted to be applied to doors for holding them open at any desired angle; and it consists in a pivoted catch lever, a notched circular plate, and a rod, all arranged to adapt the lever to be locked in various positions, and thereby hold the rod engaged with the floor.

Value of Patents,

AND HOW TO OBTAIN THEM.

Practical Hints to Inventors.

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent even when the invention is but a small one. Larger inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe, and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

More than FIFTY THOUSAND inventors have availed themselves of the services of MUNN & Co. during the TWENTY-SIX years they have acted as solicitors and Publishers of the SCIENTIFIC AMERICAN. They stand at the head in this class of business; and their large corps of assistants, mostly selected from the ranks of the Patent Office: men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office: enables MUNN & Co. to do everything appertaining to patents BETTER and CHEAPER than any other reliable agency.

HOW TO OBTAIN *Patents*. This is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office. Such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

Rejected Cases.

Rejected cases, or defective papers, remodeled for parties who have made applications for themselves, or through other agents. Terms moderate. Address MUNN & Co., stating particulars.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row, New York.

Reissues.

A reissue is granted to the original patentee, his heirs, or the assignees of the entire interest, when, by reason of an insufficient or defective specification, the original patent is invalid, provided the error has arisen from inadvertence, accident, or mistake, without any fraudulent or deceptive intention.

A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address MUNN & Co., 37 Park Row, for full particulars.

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Foreign designers and manufacturers, who send goods to this country may secure patents here upon their new patterns, and thus prevent others from fabricating or selling the same goods in this market.

A patent for a design may be granted to any person, whether citizen or alien, for any new and original design for a manufacture, bust, statue, alto relievo, or bas relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics; any new and original impression, ornament, pattern, print, or picture, to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture.

Design patents are equally as important to citizens as to foreigners. For full particulars send for pamphlet to MUNN & Co., 37 Park Row, New York.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing MUNN & Co., 37 Park Row.

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Any person or firm domiciled in the United States, or any firm or corporation residing in any foreign country where similar privileges are extended to citizens of the United States, may register their designs and obtain protection. This is very important to manufacturers in this country, and equally so to foreigners. For full particulars address MUNN & Co., 37 Park Row New York.

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On the first of September, 1872, the new patent law of Canada went into force, and patents are now granted to citizens of the United States on the same favorable terms as to citizens of the Dominion.

In order to apply for a patent in Canada, the applicant must furnish a model, specification and duplicate drawings, substantially the same as in applying for an American patent.

The patent may be taken out either for five years (government fee $20) or for ten years (government fee $40) or for fifteen years (government fee $60). The five and ten year patents may be extended to the term of fifteen years The formalities for extension are simple and not expensive.

American inventions, even if already patented in this country, can be patented in Canada provided the American patent is not more than one year old.

All persons who desire to take out patents in Canada are requested to communicate with MUNN & Co., 37 Park Row, N. Y., who will give prompt attention to the business and furnish full instruction.

Copies of Patents.

Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with official copies at a reasonable cost, the price depending upon the extent of drawings and length of specification.

Any patent issued since November 27, 1867, at which time the Patent Office commenced printing the drawings and specifications, may be had by remitting to this office $1.

A copy of the claims of any patent issued since 1836 will be furnished for $1.

When ordering copies, please to remit for the same as above, and state name of patentee, title of invention, and date of patent. Address MUNN & Co., Patent Solicitors, 37 Park Row, New York city.

MUNN & Co. will be happy to see inventors in person, at their office, or to advise them by letter. In all cases, they may expect an *honest opinion*. For such consultations, opinions and advice, *no charge is made*. Write plainly; do not use pencil, nor pale ink; be brief.

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Wanted—A Lathe, or Hollow Mandril, for turning poles 9 to 10 ft. long, and with gradual swell in middle, or the address of parties owning such, and willing to turn said poles. Jno. N. Fuller, box 123, Cleveland, Ohio.

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Machinery at the Vienna Exposition. See the Vienna correspondence of the *Boston Journal of Commerce*, $3 a year.

Lathe for Sale—One first class screw cutting, swing 21 inch by 8 feet. Nearly new. Otto Steen, Enterprise, Miss.

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Wanted, by I. Houck, of Clarksville, Albany Co., N. Y., a small Portable Engine on Wheels.

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Peck's Patent Drop Press. For circulars, address Milo, Peck & Co., New Haven, Conn.

Steam Fire Engines, R.J.Gould, Newark, N.J.

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For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

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Notes & Queries

W. N. B. asks: Can I use tubes both above and below a Whitelaw or Barker wheel, and have the same percentage of power from the water which I should get if I took it only above or below? I wish to try it to counteract the pressure of water which I find when it is taken from either only. The friction on the step is so great that it will not stand, as, if taken from below, the wheel cannot be held down without great loss of power. I intend to try it under a head of 220 feet with a wheel of 4 feet diameter, with openings for discharge pipes of ½x4 inches. How many horse power can I get using 68 per cent of the water? How many revolutions will the wheel make?

P. G. asks if oyster shells, standing in a heap for a number of years, are as good as new shells for making lime for building purposes.

S. A. D. says: In eating canned fish one frequently finds the vertebræ and large bones holding their form and crushing under the teeth like wet chalk; while the smaller bones are completely absent. By what process are the small bones thus robbed of their bony structure and destroyed?

C. D. R. asks where paper or pulp is being made from palmetto leaves.

H. H. asks: What kind of varnish or paint should be used for coating the back or metallic part of covered cloth coat buttons, so that the short edge can be turned without breaking or cracking the varnish?

N. C. says: I have a great deal of trouble every year in branding my cattle. I have to lasso and throw them down, tieing them fast; then I heat an iron and burn the brand in the hide. Could not some of our scientists invent some acid that would leave a mark on the hide, preventing the growth of hair and save the torture to the animal by burning?

W. L. says: I am troubled with a hissing noise in my left ear, the result of cold caught last fall, I think. Do any of your readers know of a remedy, or of anything that will alleviate the noise?

S. N. G. would like to know the process of making crystal or sponge gold for dental purposes.

J. L. C. asks for a preparation that can be used (in liquid form) for cleaning and removing heat stains from hot finished work, such as cylinder heads, steam chests, etc.

B. F. B. asks if there is anything in the manufacture of articles made of malleable cast iron, which renders them liable to rust. "I have had trouble with things made partly of common cast iron and partly of malleable cast iron, from the malleable parts rusting."

B. F. B. says: I have tried the process given in the SCIENTIFIC AMERICAN for japanning small iron articles, by placing the articles in an iron kettle with bituminous coal and setting the kettle on a fire, and I cannot make it work. Should the cover of the vessel be luted on, and should any particular coal be used, and how long should the baking continue?

W. S. asks how best to cut glass tubing into various lengths.

W. M. McD. asks: Is there anything which will kill coal tar on wood, so that the latter can be painted in light colors without danger of the dark hue coming through again?

F. A. S. asks for directions for constructing a stove for drying fruit, etc., which will not change the color.

A. B. W. asks how to make logs durable. They are placed underground, to conduct water.

A. B. W. asks: What is the best method for hardening gold, silver, and brass pin tongues, links, and eyes for sleeve buttons, etc.?

A. J. B. asks for the best means of separating the base metals from silver and gold ores.

B. F. B. says: I find need of a portable lamp for car use, and am engaged in getting one up, but am troubled as to what to burn in it. Is there any oil except whale oil that will burn without a chimney, or is there any device for burning kerosene without a chimney, which is successful?

Answers to Correspondents

P. P., Jr., will find directions for black enamel on iron, on p. 203, vol. 28.—C. T. S. and E. B. T. will find a recipe for gold lacquer on p. 299, vol. 28.—P. B. can blue his steel articles by using the process described on p. 10, vol. 25.—J. W. will find a waterproof cement for leather described on p. 119, vol. 28.—J. C. M. will find directions for thawing out frozen water mains on p. 266, vol. 26.—C. T. S. should read the last few numbers of our journal, in which full directions for tempering steel for all purposes are given.

J. H. says: We are desirous of coating the inside of a wrought iron stand pipe, of 126 feet hight, with some material for preventing rust. The use of soluble glass has occurred to me; will it answer, for any length of time? Answer: If the pipe is subjected to changes of temperature or to sudden shocks, the glass coating would be liable to crack and break off. Probably the best coating for your pipe would be that used by the cities of New York and Brooklyn and largely employed in England. Heat coal tar pitch (from which the naphtha has been distilled, and which has the consistency of wax when cold) to a temperature of 300° Fahr., and dip the pipe into it, retaining it there until the metal has acquired the same temperature. The pipe must be free from rust and perfectly clean, before dipping. It is well to cover it with linseed oil, before coating it with the coal tar pitch.

V. W. K. asks: Will a machine have the same power if driven by a 10 inch pulley that it now has, being driven by a 20 inch pulley, face speed of both pulleys being the same? Answer: Yes, if the belt does not slip any more, after the change is made, than it did formerly.

G. Van H. says: I have a bored well 200 feet deep, 5 inches in diameter, which has 50 feet water in it. I propose putting in a pipe 1¼ inches in diameter with a cylinder 3 inches in diameter. I shall use a wind mill to raise the water. Now how deep shall I place the cylinder in the well to get the best result? Answer: Put your pump within 20 feet of the level at which you are always sure to have water.

S. asks: Are there any glasses made which will enable a shortsighted eye, now able to read ordinary type at a distance of 3 inches without glasses, to read at 2 feet or more? Can such glasses be used in spectacle frames? Answer: You can probably get such glasses from a good optician. They could be used in spectacle frames, but if they were very thick, the ordinary frames would not answer, and a special form would be required.

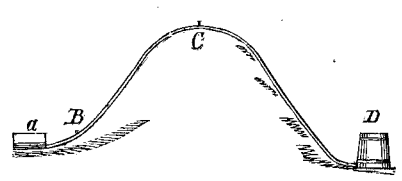
E B. asks: Can you inform me how I can rid a house of cockroaches? Answer: Arsenic in the form of Paris green, placed in the crevices of the floors near the sinks, is much used for the purpose. It is sure death to the roaches—and other members of the family who swallow it.

C. B. U. asks: Can you inform me of any method or liquid to dissolve or clean hard polish, such as piano varnish, from carvings, without sand papering or otherwise scratching the wood? Answer: Try alcohol, or a mixture of alcohol with chloroform or ether.

J. N. J. asks: Why is it that farms on the lakes that were high and dry fifty years ago are now abandoned, and water standing on them? Does the water rise higher now than it did then? Answer: Careful observations of the coast line for a series of years have shown that there is a regular depression of the land going on in one section, and a steady elevation in another. The cause of this is ascribed by many to the internal cooling of the earth, causing expansions and contractions.

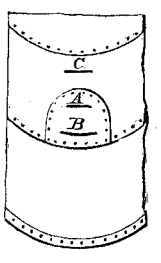
J. E. says: I have a cistern from which the water is pumped through a leaden pipe running to the bottom of the cistern. What can be attached to the end of the pipe in the cistern to act as a filter? The water at certain seasons tastes badly; can this be remedied by any thing used to pass the water through? Answer: Put the end of the pipe into a barrel filled with charcoal. This will filter the water very well; and unless the water is unusually dirty, it will work for two or three months, when it will require to be cleaned out.

A. W. S. asks: Will you please explain the cause of the following? A line of pipe for the purpose of transporting oil is laid from a, a pumping station, over



an elevation of 300 feet, at C, to the iron tank at D. The pump at a has a 12 inch steam cylinder, and a 4 inch oil cylinder, and 24 inch stroke. It is driven by a boiler of 50 horse power, which carries 80 lbs. of steam. The pipe is made of wrought iron, with a lap weld, and has an inside diameter of 2 inches. When pumping at the rate of 100 barrels per hour, the pressure at B, as shown by the gage, is 800 lbs., while that at C is 400 lbs.; and yet the pipe frequently bursts at the highest point of elevation, and seldom shows a leak at the point where gage shows highest pressure. Please explain this seeming paradox. Answer: The pipe is split by the impact of the oil. If the pump is stopped, the oil will fall away at either side from the highest point. On starting up, the oil may separate at the highest point, creating a vacuum there. The following oil will rush in with great velocity, and, its motion being suddenly arrested, will react upon the pipe, either splitting it at once, or weakening it so much that it will afterwards break. Water pipes in houses are frequently burst in a similar manner, the motion of the water being arrested by suddenly closing the supply cock.

J. B. E. says: Suppose that car oil is fired under an old boiler of poor iron, and the boiler springs two leaks [see diagram] A B, in the second sheet, shortly after the oil is fired; and suppose that the boiler runs (during more than a year) sometimes for seven weeks without cleaning. The iron was apparently all right one evening, and the night man allowed steam to run down to 10 lbs. and then fired car oil to get up steam. The next day, when extra fire was necessary, the boiler sprung a leak at C. The boiler had been cleaned two weeks before, but scraping and brushing the rivets and edge of sheet around the first patch was not done. This edge always leaked considerably after brushing out all the corners. 1. Was it the mud or the firing of the oil that caused the leak? 2. Is it true that, as long as the fire agitates the water in a boiler, the mud is almost equally distributed throughout the boiler, leaving the bottom as clear as any other part under water? Thus, if a boiler runs for four weeks and more, one fifty-sixth of the water is blown out twice a day, and there will always be nearly the same amount of mud in the boiler, excepting the scale which adheres to the bottom. In twenty minutes after blowing off steam, pulling out the fire, and opening the manhole, the water is settled as clear as it appeared before entering. Is it a positive fact that mud settles on a leak after it is sprung, or does mud settle to a certain place as long as the iron is solid and the temperature even and high enough to agitate the water? Answers: 1. We do not know what our correspondent means by car oil, unless it is one of the hydrocarbons; but whatever it is, it could scarcely cause the leak, which must be attributed to the mud or scale. 2. Unless the circulation is unusually good in a boiler, or unless the boiler primes, most of the mud will be at the bottom. When a boiler leaks, a current is created in the direction of the leak, and the mud will be drawn to that point.



H. B. asks (1) which will require the most power to saw a board 12 inches wide, a circular saw just large enough to reach through it, or one large enough to saw 24 inches with the same feed. 2. Will a 54 inch saw with 40 teeth require any more power than one of the same size with 28 teeth? Answers: 1. A saw just large enough to cut through a board will require less power than a saw larger, the number of teeth, speed and the thickness being equal in each. 2. The more teeth, the more power, provided the thickness, speed and feed are equal. There is, however, a limit, or a point where a few teeth will not answer the place of a larger number. The thinner the saw, the more teeth will be required to carry an equal amount of feed to each revolution of the saw, but always at the expense of power.—J. E. E. of Pa.

A. C. S. asks: Which is the strongest bevel gear: 6 feet 6 inches diameter, with 8½ inches pitch and 12 inches face, or 6 feet diameter with 4 inches pitch and 10 inches face? The pinions in each case are nearly 1 to 2. Answer: If the pinions have the same relative size in each case, and the power applied is the same in both cases, the larger gear will be the stronger.

P. P. Jr., asks how to dissolve india rubber so as to run it in a mold and then harden it, and if plaster of Paris would answer to make a mold with. Is there any other material that would answer the same purpose as india rubber and be equally elastic? 2. Is there any convenient way of taking the fluid contents out of a barrel and putting the same into a can without using a pump, supposing the barrel to lie on the floor and the top of the can to be about 7 feet from the floor? Answers: See answer to S. J. N. in No. 24 of our volume XXVIII. 2. There are several kinds of lifting pumps made for this purpose. If you want to take out only a small quantity at a time, say a quart or less, you can take a piece of tin leader or tubing and have it made to taper almost to a point at each end. On putting it into the cask it will fill up to the level of the surface of the liquid; then stop the upper end with your thumb and you can safely lift out the tube and contents. Small apparatus of this kind made of glass are used by chemists under the name of *pipettes*, and are so graduated as to act as measures at the same time.

E. J. M. says: There is a difference of opinion as to which side of a gum belt, the inside or outside (as usually put up in coils) should be next the pulley. The minority holds to the outside plan, the majority to the inside. "Our army swore terribly in Flanders;" had the SCIENTIFIC AMERICAN been in existence then, "our army," I opine, would have done as we of Texas do, swear by it. Answer: This seems to be one of those rare cases in which both majority and minority are right As ordinarily made, the outside and inside of a rubber belt are precisely alike, so that it can make no difference which side is next to the pulley. We are much obliged for our correspondent's good opinion of the paper, which is only one of the many kind testimonials we are constantly receiving.

X. Y. Z. asks why it is that large files are cut coarser than small ones. "I will say that they would be much better if cut fine, as they would do more work and do it better. 2. Would it not benefit a large class for industrial fairs to give premiums for the best method of filing saws, the saws to be filed to do the best work with the least power? I find it rare for even a first class workman to know anything about the principle of filing a saw to do nice work. In twenty years experience, I do not recollect seeing more than two or three that could do it, and I see no reason why this should be so." Answers: 1. It is more difficult to cut a large file finely than a small one; though if there was much demand for the kind of files mentioned by our correspondent, they would probably be manufactured. 2. The idea of offering a premium for the best method of filing saws is a good one, and would be productive of useful results, if carried out. Perhaps those of our readers who are experienced in saw filing will favor us with communications.

A. B. W. asks what is the best mode of fastening lamp globes to the burners? Answer: Cement with plaster of Paris.

J. L. G. says: Some time since a gentleman buried a large amount of gold in this neighborhood, and went away. While absent he died; but before dying, he gave a description of the place, the amount, and the manner in which it was buried. We have made several ineffectual efforts to discover it according to the description of the place and directions furnished by the deceased. We feel sure that it is buried there, and desire to ascertain of you whether there is any scientific mode by which it may be discovered, or that would aid us in the search, and at what cost, and where it may be procured. Answer: Dig until you find it. Science shows no royal road to golden treasures.

G. B. M. says: 1. Please give some method for preserving leaves and flowers in their natural colors 2. What is the capacity of the Croton aqueduct and the estimated water supply to the city of New York? 3. What are the standard works on mineralogy and where can they be obtained? Answers: 1. Flowers can be preserved by dipping them in melted paraffin. This applies however, better to white than colored flowers. For colored ones, the paraffin should be suitably colored. 2. The Croton aqueduct is capable of conveying 120,000,000 to 130,000,000 gallons of water per day. The amount consumed is about 90,000,000 per day, or over 90 gallons to each man, woman, and child. The largest reservoir in the Central Park has a capacity of 1,000,000,000 gallons; the old reservoir near it contains 150,000,000 gallons, and the miniature distributing reservoir at 42nd street holds only 20,000,000 gallons, or enough to last about 6 hours. 3. Dana's "Mineralogy" is the very best work extant. It sells for $10. There are smaller works, such as Professor Eggleston's "Lecture Notes," which are convenient for reference; but "Dana" is the best.

G. L. R. asks for the best authorities on the subject of preservation of timber, and the effects of chemicals on wood generally. Answer: You will find an excellent article on this subject in Wagner's "Handbook of Chemical Technology," translated by Crookes. Several exhaustive articles on this subject, by Dr. A. Ott, appeared in the *Engineering and Mining Journal*, November 22, 1870, and *Journal of Applied Chemistry*, October and November, 1870. Colonel J. T. Crane, United States Corps of Engineers, made a report, on the 9th of September, 1870, to the Chief of Engineers, United States Army. This was published in the *American Chemist* for February, 1872. In this report, tabular results are given showing the comparative time which ties, etc., lasted when treated in different ways, more especially relating to creasoting.

J. H. asks for our opinion on the following matters: 1. I am using an engine 7x30, running at 60 revolutions per minute. The boiler is nearly new, of 30 inches diameter, with 26 tubes 9 feet long and 3 inches diameter. The steam pipe from boiler to engine is 28 feet long and of 2 inches internal diameter. When all our works are on, 30 lbs. on the boiler more than drives our engine at full speed. How much power should that pressure give? The pipe and the engine are left bare. 2. I am using, for this amount of power, an enormous quantity of coal, and I want to know if I cover the steam dome pipe to engine, the engine, and the feed water pipe from steam heater to boiler (24 feet), how much saving of coal would there be? 3. Would it not be well to slow the engine nearly half, driving the shaft same as now; then I could get about 50 lbs. to the inch on my engine before the governor would close, instead of 20, 25, or 30 lbs. as at present? 4. How much coal

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should we really use to get the above power? 5. My engine is a plain slide valve in very good condition. At how much cut-off should the slide valve be set? Answers: 1. Our correspondent does not state the point at which steam is cut off, so that we cannot tell what power the engine is developing. 2. Considerable saving of fuel would be produced, by felting the pipes; possibly as much as ten per cent. 3. Instead of reducing the speed of the engine, it would be better to cut off the steam at an earlier point of the stroke and increase the initial pressure. Questions 4 and 5 show that this is a case where it would be well to consult a good engineer, who would probably suggest improvements which would result in great saving of fuel.

B. says: 1. I have, in a 40 horse power five flue boiler, 60 lbs. of steam; the boiler is half full of water, when the water is cooled down to 60°. What will be the pressure on the outside of the boiler (presuming the boiler to be airtight)? 2. When I begin to get up steam, should I let out the air in the boiler as fast as the pressure will force it, or keep it confined? 3. Will the corrosion around rivets that leak become dangerous? What is the easiest way to stop such leaks? Answers: 1. The pressure outside the boiler will be about 14·7 pounds per square inch. The pressure inside the boiler, above the water, will be about ¼ of a pound per square inch. Below the water line the pressure per square inch will be the weight of a column of water of one inch cross section and with a hight equal to the depth of the pressed surface below the water level. 2. In raising steam, the best plan is to keep the safety valve open until steam is formed. 3. Yes. If the leaks cannot be stopped by caulking the heads of the rivets, the rivets must be cut out and replaced by new ones.

W. A. B. says: 1. Will nitrate of silver do for making silver solution for electro-plating? I mean the lunar caustic sold in drug stores. 2. Will a piece of wrought or cast iron do for one of the poles of the Bunsen battery, instead of carbon? 3. Is there any difference between cyanide of potassa and cyanide of potassium? 4. How much silver and cyanide of potassa does it take to make one gallon of solution? 5. Does it make any difference if the vat, in which you place your solution of cyanide of silver, be made of cast iron? Answers: 1. Lunar caustic, or coin and silver scraps dissolved in nitric acid, may be employed in making cyanide of silver for electro-plating. 2. Iron will not answer instead of carbon, but platinum will. You can obtain large pieces of gas carbon gratis from any gas house when they are cleaning out retorts. It is very hard, but can be sawn with a fine saw, if you have patience. 3. Cyanide of potassa is incorrect; it should be cyanide of potassium. It is very poisonous and requires care in using. 4. Dissolve 3½ ozs. of cyanide of potassium in 1 quart of distilled water; and in this solution, dissolve well washed chloride of silver (precipitated from nitric acid solution by hydrochloric acid) until a saturated solution of cyanide of silver is obtained; then dilute with an equal bulk of water. 5. An iron vat will cause the silver to be deposited upon it unless lined with paraffin, asphalt or other non-conductor.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Using Water as Fuel. By A. W. T.

On the Southern Canal. By P. K. McM.

On Life Saving Inventions. By J. C., and by L. S.

On Asiatic Cholera. By C. McD.

On the Ponca Fossil Remains. By C.W. P.

On Psychic Force on the Slate. By S. C. D.

On the Million Dollar Telescope. By T. M. P.

On a Transatlantic Balloon Voyage. By C. R.

On Screwing in Studs. By J. W. T.

On Slivers. By J. M.

On the Australian Water Cooler. By O. C. W.

On Corundum in Pennsylvania. By W. K. S.

On Metallurgy. By J. T.

On Deep Sea Soundings. By —.

Also enquiries from the following:

A. M.—L. G.—A. G. J.—A. H.—R. W. Co.—O. A. M.—C. R.—E. M. H.—W. K. C.—J. H. P. & Co.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal," which is specially devoted to such enquiries.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED FOR THE WEEK ENDING

June 3, 1873,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Alarm, till, J. F. Baldwin 139,350
Animal power, chain for, G. N. Palmer 139,604
Bag fastening, mail, B. X. Blair 139,536
Basket, work, T. V. Hobbs 139,508
Bed bottom, spring, C. Gammel 139,567
Bed, spring, S. Stout 139,627
Bedstead, invalid, A. Bray 139,493
Bedstead, parlor, F. E. Coffin 139,454
Billiard cue, H. Platts 139,519
Bin, sweet potato, etc., H. T. Basye 139,532
Block, building, S. T. Fowler 139,462
Bobbin, A. I. Earl 139,558
Bouquet holder, A. F. Ransom 139,477
Box, fur set, Aikin & Stone (r) 5,430
Brush, C. W. Palmer 139,474
Buildings, construction of, H. H. Bryant 139,451
Burial casket, Henika & Carder 139,465
Burner, gas, D. E. Ryan 139,481
Butter worker, W. N. Golden 139,571
Button hole cutter, W. C. McGill 139,472
Canceling stamp, hand, E. H. Thomas 139,486
Car brake, automatic railroad, G. E. Earl 139,557
Car brake, railway, J. S. Anderson 139,527
Car, dumping, Hanford & Wood 139,575
Car pusher, A. S. Bailey 139,529
Car seat, F. Farrell 129,561
Car, sleeping, J. S. & D. R. Leighton 139,587
Car starter, Field & Steger 139,563
Card cylinders, etc., traversing, F. Herboth 139,466
Card case, Miller & Bennett 139,513
Carriage hook, landau, O. S. Osborn 139,515
Carriage top, G. Bockstaller 139,450
Case for indexes, C. E. Fellows 139,503
Caster, furniture, C. B. Sheldon 139,619
Chair, W. Gardner 139,568
Chair, step ladder, H. Willgohs 139,488
Chair, tipping, H. K. White 139,639
Cigar drying mold, N. W. Palmer 139,517
Clothes washer, W. R. Brooks 139,494
Clothes wringer, D. M. Cole 139,545
Coal mining machine, W. Case 139,541
Cock, stop, G. W. Eddy 139,559
Conductor, drip, J. G. Widmann 139,641
Cooling rooms, apparatus for, A. M. Lesley 139,470
Corn husker, C. A. Lang 139,586
Corn, preserving, L. McMurray 139,595
Corn row marker, Cooke & Cross 139,546
Cultivator, J. P. Manny 139,471
Cultivator, Richardson & Behel 139,478
Cultivator teeth, manufacture of, J. Behel 139,535
Curtain fixture, L. A. Tripp (r) 5,439
Desk, school, J. W. Childs 139,543
Drawing board, A. Hitchcock 139,507
Dryer, offal, M. Anderson 139,528
Drill gage, A. C. Trafton 139,487
Drill, grain, B. Kuhns (r) 5,432
Drill, grain, G. A. Pursly 139,610
Drilling machine, W. H. Thorne 139,629
Dumping apparatus, G. W. Reed 139,613
Dyeing fabrics, F. G. Graupner 139,573
Egg carrier, H. Bryant 139,540
Elevator, hydraulic, T. Stebins 139,624
Engine, compound steam, W. W. Crane 139,549
Engine, steam, Babcock & Wilcox 139,448
Envelope, Pink & Silverberg 139,475
Explosive compound, E. Judson 139,468
Exterminator, bed bug, C. L. Fewell 139,562
Fences, iron post for wire, D. Kaufman 139,469
Fiberous material, etc., working, J. K. Proctor 139,609
File, paper, C. Mason 139,592
Fire arm, breech loading, J. V. Meigs (r) 5,433
Fire arm, revolving, C. Foehl 139,461
Fire escape, J. A. Talpey 139,484
Fireproof roof, N. Poulson 139,607
Fly protector, I. Daugherty 139,552
Fruit, apparatus for preserving, L. R. C. Cooley 139,547
Fruit jar, A. T. Jones 139,580
Fruit, etc., preserving, Jones & Cooley 139,581
Funnel, measuring, Cohic & Shartzer 139,496
Furnace, blast, J. V. Woodhouse 139,489
Furnace, boiler, A. B. Smith 139,522
Furnace, hot air, W. O. Grover 139,505
Furnace, separating, etc., E. Balbach, Jr 139,449
Gage, draftsman's ruling, A. F. Nagle 139,601
Gas governor and by-pass, P. Munzinger 139,514
Gas lighting, electrical, Mueller & Meier 139,599
Gas regulator for vulcanizers, G. M. Hopkins 139,579
Gas retort, J. D. Patton 139,605
Governor, E. Towns 139,631
Gun barrels, cleaning, W. E. Turner 139,633
Harvester, W. K. Miller 139,596
Harvester, W. K. Miller 139,597
Harvester, W. K. Rairigh 139,611
Harvester, W. K. Rairigh 139,612
Harvester, corn, Spears & Wells 139,623
Heel burnishing machine, H. S. Vrooman 139,686
Heel plate, H. L. Drake 139,500
Hinge, sheet metal, W. H. Hart 139,464
Hoisting machine, S. Reynolds 139,614
Hook, back hand, J. Straus 139,534
Hoop locks, machine for cutting, J. McGrew 139,594
Horses, sun bonnet for, J. Anderson 139,491
Hose coupling, T. J. Trapp 139,632
Hose coupling, metallic, E. S. Elmer 139,459
Hose pipe, compound, M. Cronin 139,550
Ice cream freezer, H. B. Campbell 139,453
Ice creeper, A. Heulings 139,506
Kettle, Evans & Perry 139,502
Lamp bracket, G. Jones 139,582
Lamp post, L. A. Gouch 139,504
Latch, coach door, J. Thielemann 139,485
Leather board, manufacture of, S. Moore 139,598
Leather, skiving, J. W. Chandler 139,495
Lock, bag, H. Ahrend 139,526
Logs, moving, Hinckley & Rodgers 139,578
Loom stop mechanism, W. Edson 139,560
Mangling, etc., machine, Hall & Newton 139,574
Matches, cutting, Cummings, Smith & Jordan 139,457
Meat cutter, M. L. Edwards 139,501
Mechanical movement, J. B. Doolittle 139,499
Mill, cider, W. Rice 139,315
Mill, flour, J. Dean 139,553
Mill feeder, C. P. Stanford 139,523
Millstones, hanging, A. W. Winall 139,642
Millstones, leveling, W. Ring 139,479
Nail assorting apparatus, J. Coyne 139,548
Nut lock, Hull & Brown 139,467
Oil wells, increasing capacity, E. A. L. Roberts, (r) 5,434
Ore washer, R. Gidley 139,570
Ores, etc., apparatus for separating, H. H. Eames 139,556
Organ, reed, A. J. Sorensen 139,483
Pan, evaporating, G. W. Storer 139,625
Picks, manufacturing, D. Collins 139,455
Pipe fittings, tapping, J. L. Pope 139,476
Pipes, etc., introducing water, Fritz & Pooley 139,566
Planter, corn, A. Rohmer 139,617
Planter, corn and cotton, Z. B. Sims 139,620
Plow truck, J. Flanagan 139,564
Poudrette, drying, L. Duvall 139,555
Post wire attachment, J. P. Terrell 139,630
Printer's chase, L. G. Chaput 139,512
Pulley, friction clutch, J. D. Crocker 139,456
Purifier, middlings, E. N. Lacroix 139,585
Rack and boot jack, towel, C. Darnstaedt 139,551
Railroad crossing, J. Wood 139,643
Railroad switch, J. F. Linthicum 139,589
Railroad switch, W. H. Van Gieson 139,635
Railroad tie, Peck & Richmond 139,518
Rivers, removing sand bars in, A. Garnham 139,569
Sad, fluting and band iron, A. S. Mann 139,590
Saw, band, C. A. Young 139,644
Saws, adjusting circular, S. W. Clemmens 139,544
Sawing machine, Detrick & Culver 139,554
Seed dropper, J. M. Forden 139,565
Sewing machine caster, J. H. Plank 139,606
Sewing machine caster, G. K. Proctor 139,608
Sewing machine cutter, J. E. Wiggin 139,525
Sewing machine fan, E. Kempe 139,584
Sewing machine shuttle, Edwards & Schieder, (r) 5,436
Sheet metal, corrugating, F. Roys 139,480
Skate, W. Strasser 139,629
Skirt, hoop, Lockwood & Carter 139,510
Sled brake, J. Slater 139,621
Smoothing and fluting iron, J. Hewitt, (r) 5,437
Solder, flux for, C. E. Yager 139,490
Soldering iron, Blaisse & Branner 139,537
Soldering machine, W. D. Brooks 139,539
Sole channeling machine, H. S. Vrooman 139,637
Sole pressing machine, C. M. Hayden 139,577
Spark arrester, T. D. Hendrick 139,509
Speeder, G. W. Olney 139,603
Spring, door, D. Dick 139,458
Stamp holder, adhesive, S. V. Beckwith 139,492
Staple, blind slat, C. H. Palmer 139,516
Steam condensing tank, etc., C. N. Tyler 139,634
Step cover and fender, F. H. Niemann 139,602
Stereoscope, folding, J. A. Bazin 139,534
Stove grate, W. J. Keep 139,583
Stove grate, W. J. Keep 139,583
Stove, heating, T. H. Salmon 139,618
Stove, reservoir cooking, E. Bussey, (r) 5,435
Straps, clasp for securing, O. O. Storle 139,626
Submarine blasting platform, etc., J. Burson 139,452
Telegraph pole, Carver, Athey & Jennings 139,593
Thrasher, re-winnowing, J. B. Padon, (r) 5,438
Thread dressing machine, etc., J. Short 139,521
Toy, A. R. Batchelder 139,533
Trap, animal, J. Gould 139,572
Trunk and strap fastener, J. Fairman 139,460
Turn table, Macdonald & Fritzsche 139,512
Type, E. R. Whitney 139,640
Valve, flexible lip-formed, E. Field, (r) 5,431
Valve, piston, G. H. Gibbs 139,463
Vessels, berth for, B. Weisker 139,638
Wagon running gear, A. Lewis 139,588
Washing machine, P. G. Dahmer 139,497
Washing machine, J. W. Hannah 139,576
Washing machine, M. N. Lovell 139,511
Water by condensation of air, forcing, J. M. Brooke 139,538
Water closet, portable, T. Barrett 139,531
Webbing, machine for cutting, W. A. Rice 139,616
Wheat, preparing food from, E. H. Murray 139,600
Wheel quartering machine, W. Sellers 139,482
Whip socket attachment, R. Dods 139,498
Windmill, W. D. Nichols 139,473
Work stand, ladies', G. S. Manning 139,591
Wrench, Smith & Lee 139,622
Wrench, pipe, J. Rigg 139,520

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

25,237.—HORIZONTAL WHEEL.—A. Andrews *et al.* Aug. 13.
25,343.—STOVE.—E. M. Manigle. August 20.
25,373.—PAPER BOX MACHINE.—S. B. Terry. August 20.
25,434.—COTTON SCRAPER.—J. H. Mitchell. August 27.
25,506.—LAMP.—H. Halvorson. September 3.
25,544.—TRY COCK.—J. F. Cook. September 3.
26,243.—WATER CLOSET BASIN.—W. Boch, Sr. Nov. 12.
30,201.—FREEZING APPARATUS.—F.P.E. Carre. August 13.

EXTENSION GRANTED.

24,304.—IRON MOVING MACHINE.—C. Hewitt.

DISCLAIMER.

90,973.—STEP LADDER.—C. G. Udell.

DESIGNS PATENTED.

6,694.—HAT AND COAT HOOK.—A. D. Judd, New Haven, Con.
6,695.—STRIPED FABRIC.—C. H. Landenberger, Phila., Pa.
6,696.—NUBIA.—J. Phipps, Philadelphia, Pa.
6,697.—HEATING STOVE.—J. Beesley, Philadelphia, Pa.
6,698.—WATCH HANDS.—B. A. Goodell, Waltham, Mass.

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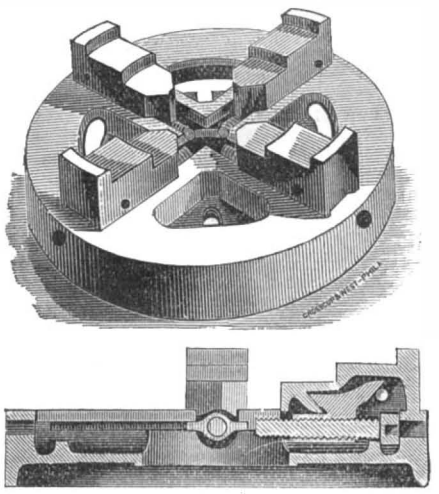

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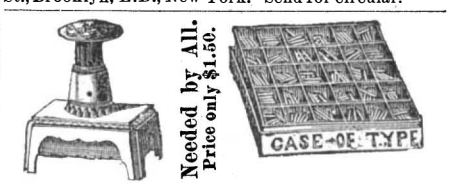

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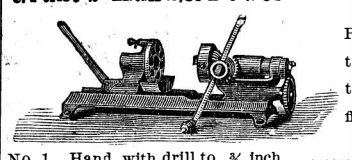

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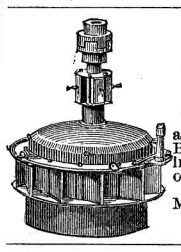

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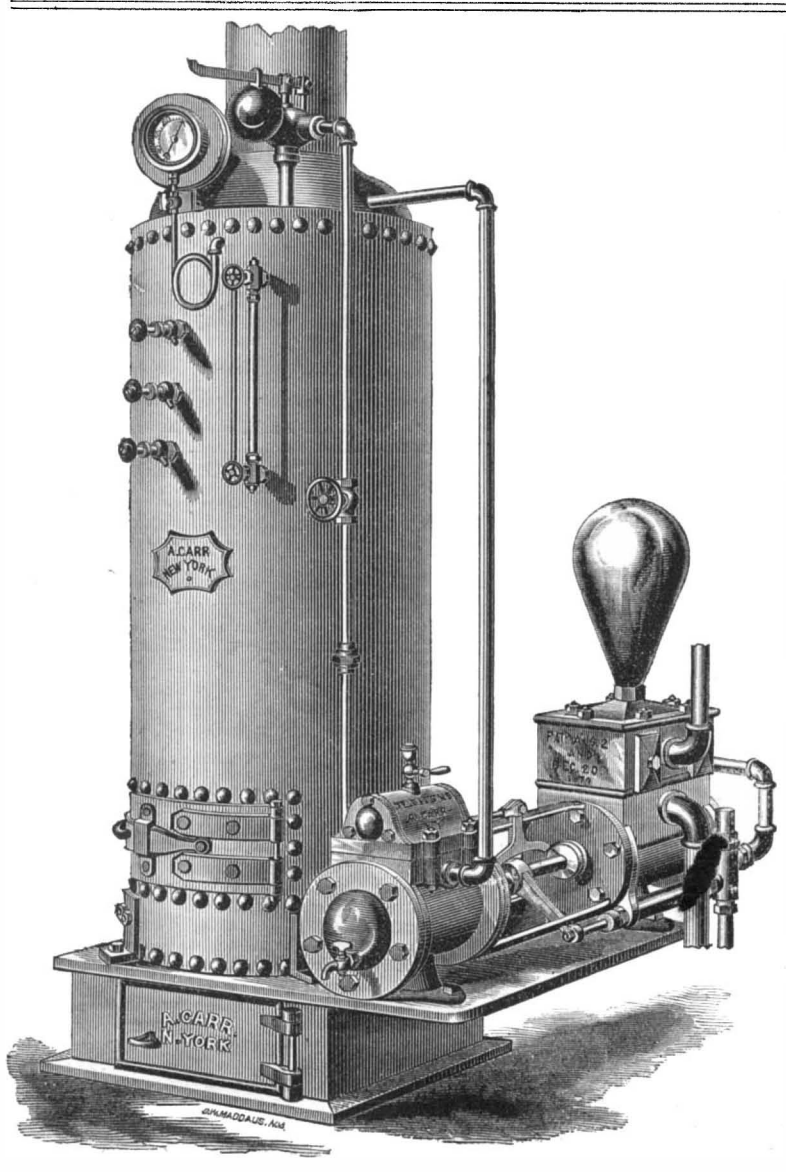

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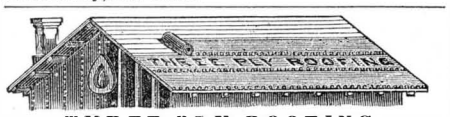

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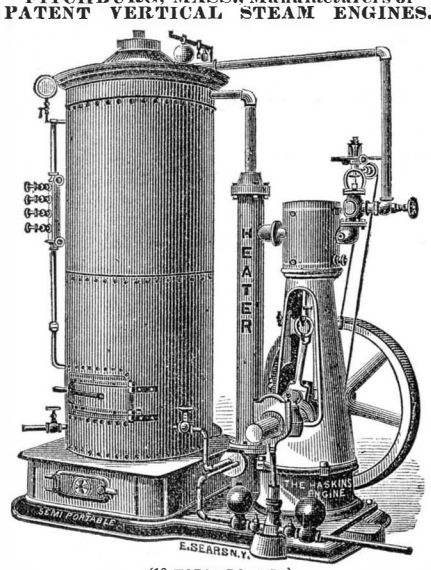

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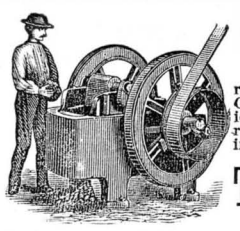

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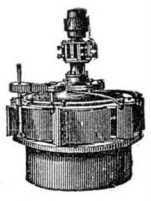

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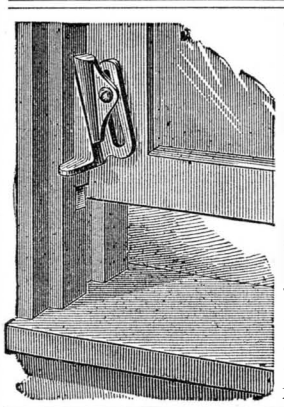

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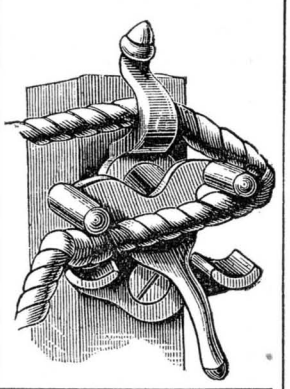

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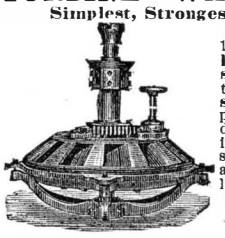

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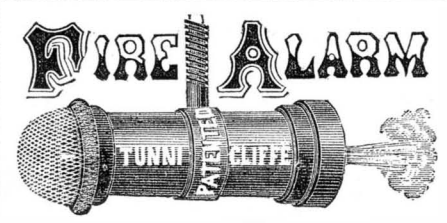

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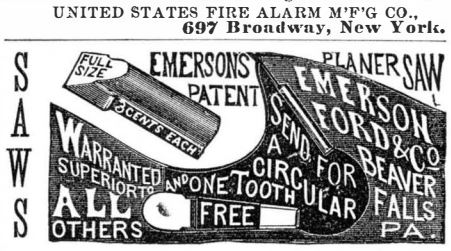

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